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ABSTRACT

This curriculum guide, developed to establish statewide curriculum standards for the Louisiana Competency-based Education Program, encompasses those standards that must be included in the elementary school (kindergarten to grade 6) science program. It consists of: (1) a rationale for an effective elementary school science program; (2) a list and description of four major goals of science; (3) a list and description of eight basic and five integrated process skills; and (4) a list of skills and curriculum outline for grades K-3 and another list of skills and curriculum outline for grades 4-6. The lists of skills and curriculum outlines are organized according to three broad disciplines: life science (senses, living/nonliving matter, plants, animals, and the human body); earth science (soil, weather, the solar system, and the earth); and physical science (change-space relations, light, sound, air, matter, heat, magnetism, electricity, and simple machines). Included for the topics within the curriculum outline are performance objectives correlated with a concept, process skill(s), and suggested activities. The outline for graphing and measuring skills for grades K-3 and 4-6 is included in appendices. Also included are brief comments on evaluation techniques. (JN)

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STATE OF LOUISIANA
DEPARTMENT OF EDUCATION

K-6 SCIENCE CURRICULUM GUIDE

BULLETIN 1613
1984

Issued by
Office of Academic Programs

THOMAS G. CLAUSEN, Ph.D.
Superintendent

FOREWORD

Act 750 of the 1979 Louisiana Legislature (R.S. 17:24.4) established the Louisiana Competency-Based Education Program. One of the most important provisions of Act 750 is the mandated development and establishment of statewide curriculum standards for required subjects. These curriculum standards include curriculum guides which contain minimum skills, suggested activities, and suggested materials of instruction.

During the 1979-80 school year, curriculum guides were developed by advisory and writing committees representing all levels of professional education and all geographic areas across the State of Louisiana for the following Science courses: Elementary K-6, Life Science, Earth Science, Physical Science, General Science, Biology, Chemistry, and Physics.

During the 1982-83 school year, the curriculum guides were piloted by teachers in school systems representing the different geographic areas of the State as well as urban, suburban, inner-city, and rural schools. The standard populations involved in the piloting reflect also the ethnic composition of Louisiana's student population. Based upon participants' recommendations at the close of the 1982-83 pilot study, the curriculum guides were revised to ensure that they are usable, appropriate, accurate, comprehensive, relevant, and clear.

Following the mandate of Act 750, the revised curriculum guides will be implemented statewide in the 1984-85 school year. The statewide implementation is not, however, the end of the curricular development process. A continuing procedure for revising and improving curricular materials has been instituted to ensure that Louisiana students have an exemplary curriculum available to them--a curriculum that is current, relevant, and comprehensive. Such a curriculum is essential if we are to provide the best possible educational opportunities for each student in the public schools of Louisiana.

Thomas G. Clausen

Thomas G. Clausen, Ph.D.

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RATIONALE FOR ELEMENTARY SCHOOL SCIENCE CURRICULUM

The Elementary Science Curriculum Guide provides abundant opportunities for the development in our students of fundamental academic skills. In using the scientific method, students have opportunities to develop language arts and mathematical skills through applied use. Activities in the curriculum guide reinforce reading comprehension skills, applied writing skills, and basic computation skills as an integral part of the scientific process. The science teacher can, by sharing responsibility for this type of instruction, contribute to student development and achievement in basic skills areas while improving the quality of student achievement in science.

For children, science is discovering why one can't find doodlebugs during the winter season; it is figuring out how to light a bulb with a wire and dry cell; it is planting a tree and watching it grow; it is the wonder and respect for life gained by nurturing a family of gerbils or hamsters. Luther Burbank once described some of the concrete learning experiences that each child should have as follows:

> Every child should have mudpies, grasshoppers, waterbugs, tadpoles, frogs, mud turtles, elderberries, wild strawberries, acorns, chestnuts, trees to climb, brooks to wade in, water lilies, woodchucks, bats, bees, butterflies, various animals to pet, hayfields, pine cones, rocks to roll, sand, snakes, huckleberries, and hornets; and any child who has been deprived of these has been deprived of the best part of his education.

Science educators and psychologists agree that elementary school children deal most effectively with concrete materials and experiences. In general, children's initial science experiences should be characterized by their experiencing the object or phenomenon while using as many of the senses as possible. Demonstrations, exhibits, pictures, and words can be used to communicate with meaning only after a good experiential foundation has been laid.

It has been the experience of the newer science programs funded by the National Science Foundation that children of all abilities can succeed and profit from a "concrete approach to science instruction." Indeed, the motivation derived from success, in addition to the motivation derived from the excitement of exploring with materials and ideas, can be an important factor in developing positive attitudes toward science and school.

Closely associated with teaching science through concrete experiences is the development of process skills. Whenever magnets, bulbs, dry cells, wire, doodlebugs, etc., are being observed and manipulated by children, process skills can be developed; however, the teacher is a crucial factor. If the teacher does not ask questions which require children to observe, infer, hypothesize, measure, design experiments, etc., these process skills will not be developed.

This guide encompasses the curriculum standards that must be included in each teacher's instructional program. The guide shall be used as a base from which to develop each teacher's own appropriate scope and sequence depending on the grade level taught and the commercial program adopted.

The curriculum standards are grouped according to three broad disciplines: Life Science, Earth Science, and Physical Science. The Life Science section includes the content strands of the senses, living/nonliving matter, plants, animals, and the human body. The Earth Science section contains the content strands of soil, weather, the solar system, and the earth. Finally, the content strands of Physical Science are change-space relations, light, sound, air, matter, heat, magnetism, electricity, and simple machines.

A detailed skills chart is included to assist teachers in organizing their instructional program. The chart will enable each teacher quickly to correlate the skills contained within the guide to the basal program he/she is currently using. The teacher will then determine the proper sequence of each content strand.

The Curriculum Standards Committee in K-6 Science agreed that it would be impossible to assign specific content strands to any one grade level because of the diversity of scope and sequence of skills from one State approved commercial program to another. In order to address this concern, the Committee felt that a scope of skills that would span grade levels would be the most appropriate concept to employ. This system will accommodate all basal programs regardless of skills sequence.

Skills that are most appropriate for grades K-3 are organized under one section, and those that are appropriate for grades 4-6 are contained in the other section. As long as these skills are included within each teacher's program, the specific grade level at which these content strands are introduced and expanded is left to the discretion of the teacher. The guide contains suggested activities designed to assist the teacher in teaching each competency; however, the teacher and the students should not be limited to these activities or obligated to use all of them. There are many other activities available to the teacher which will help him/her to present each competency and process skill to the student. It is suggested that additional textbooks, workbooks, and laboratory manuals be consulted for activities, demonstrations, and experiments to supplement those described in the curriculum guide.

Graphing and measuring skills are contained in the appendices. Graphing skills are to be incorporated into each teacher's program at the appropriate level. Measuring weight, length, and volume are to be introduced at grade levels which require their mastery; mastering these skills is necessary for students to understand the processes of science.

GOALS

Achieving scientific literacy involves the development of attitudes, process skills, concepts, and social aspects of science and technology. Based upon this belief, the following major goals of science are stated:

1. To Foster Positive Attitudes Toward the Scientific Process

Students will develop a deep appreciation of the role the scientific process plays in their everyday lives.

2. To Develop Process Skills

Process skills development should be an integral part of science activities for students. Students should be given opportunities to develop those intellectual processes of inquiry and thought by which scientific phenomena are explained, measured, predicted, organized, and communicated.

Basic Process Skills: Observing, inferring, classifying, using numbers, measuring, using space-time relationships, communicating, predicting.

Integrated Process Skills: Controlling variables, defining operationally, formulating hypotheses, interpreting data, experimenting.

3. To Acquire Knowledge

Included in the basic science curriculum should be those scientific facts, principles, concepts, and terms which will enable the students to understand and interpret natural phenomena.

Areas of Knowledge: Life Science, Physical Science, Earth Science

4. To Recognize Social Aspects of Science and Technology

The students should (a) understand the interrelationships of science, technology, and social and economic development; and (b) recognize both the limitations and the usefulness of science and technology in advancing human welfare.

PROCESS SKILLS

Eight basic science process skills are stressed: (1) observing, (2) inferring, (3) classifying, (4) using numbers, (5) measuring, (6) using space/time relationships, (7) communicating, and (8) predicting. There is a progressive intellectual development within each process category. A brief description of each basic process skill follows:

OBSERVING:	To observe is to use one or more of the five senses to perceive properties of objects or events as they are. Statements about observations should be (1) quantitative where possible, (2) descriptive regarding change(s) and rates of change(s), and (3) free of interpretations, assumptions, or inferences.
INFERRING:	To infer is to explain or to interpret an observation. Inferences are statements which go beyond the evidence and attempt to interpret or to explain one or more observations. Inferences are based on (1) observations, (2) reasoning, and (3) past experiences of the observer. Inferences require evaluations and judgments, and they may or may not be accurate interpretations or explanations of the observation.
CLASSIFYING:	Classifying is the grouping or ordering of phenomena according to an established scheme. Objects and events may be classified on the basis of observations. Classification schemes are based on observable similarities and differences in arbitrarily selected properties. Classification keys are used to place items within a scheme as well as to retrieve information from a scheme.
USING NUMBERS:	To use numbers is to describe the measurement, properties, and relationships of quantities through the use of symbols.
MEASURING:	To measure is to find out the extent, size, quantity, capacity, and other properties of a given object, especially by comparison with a standard. Once the concept of measuring is introduced and mastered in first grade, the metric and/or SI system should be used exclusively.
USING SPACE/TIME RELATIONSHIPS:	Space/Time relationships is the process that develops skills in the description of spatial relationships and how they change with time. This process skill includes the study of shapes, time, direction, spatial arrangement, symmetry, motion, and rate of change.
COMMUNICATING:	To communicate is to pass information along from one person to another. Communications may be verbal, nonverbal (i.e., gestures), written, or pictorial (pictures, maps, charts, and graphs). Communications should be concise, accurate, clear, precise descriptions of what is perceived.

PREDICTING: Predicting is forecasting what future observations might be; it is closely related to observing, inferring, and classifying. The reliability of predictions depends upon the accuracy of past and present observations and upon the nature of the event being predicted.

As basic progressive, intellectual development proceeds in each basic process skill, the interrelated nature of the processes is manifested in the five integrated processes: (1) controlling variables, (2) defining operationally, (3) formulating hypotheses, (4) interpreting data, and (5) experimenting. A brief description of each integrated process skill follows:

CONTROLLING VARIABLES: A variable is any factor in a situation that may change or vary. Investigators in science and other disciplines try to determine what variables influence the behavior of a system by manipulating one variable, called the manipulated (independent) variable and measuring its effect on another variable, called the responding (dependent) variable. As this is done, all other variables are held constant. If there is a change in only one variable and an effect is produced on another variable, then the investigator can conclude that the effect has been brought about by the changes in the manipulated variable. If more than one variable changes, there can be no certainty at all about which of the changing variables causes the effect on the responding variable.

DEFINING OPERATIONALLY: To define operationally is to choose a procedure for measuring a variable. In a scientific investigation, measurements of the variables are made; however, the investigator must decide how to measure each variable. An operational definition of a variable is a definition determined by the investigator for the purpose of measuring the variable during an investigation; thus, different operational definitions of the same variable may be used by different investigators.

FORMULATING HYPOTHESES: To formulate a hypothesis is to make a guess about the relationships between variables. A hypothesis is usually stated before any sensible investigation or experiment is performed because the hypothesis provides guidance to an investigator about the data to collect. A hypothesis is an expression of what the investigator thinks will be the effect of the manipulated variable on the responding variable. A workable hypothesis is stated in such a way that, upon testing, its credibility can be established.

INTERPRETING DATA: The process of interpreting data may include many behaviors such as (1) recording data in a table, (2) constructing bar and line graphs, (3) making and interpreting frequency distributions, (4) determining the median, mode, mean, and range of a set of data, (5) using slope or analytical equations to interpret graphs, and (6) constructing number sentences describing relationships between two variables. Interpreting data requires going beyond the use of skills of tabulating, charting, and graphing to ask questions about the data which lead to the construction of inferences and hypotheses and the collecting of new data to test these inferences and hypotheses. Interpretations are always subject to revision in the light of new or more refined data.

EXPERIMENTING: (Using the scientific method): Experimenting is the process of designing a procedure that incorporates both the basic and integrated process skills. An experiment may begin as a question for the purpose of testing a hypothesis. The basic components of experimenting are as follows:

1. Constructing a hypothesis based on a set of data collected by the person from observations and/or inferences.
2. Performing a test of the hypothesis. The variables must be identified and controlled as much as possible. Data must be collected and recorded.
3. Describing or interpreting how the data support or do not support the hypothesis, i.e., deciding whether the hypothesis is to be accepted, modified, or rejected.
4. Constructing a revised hypothesis if the data do not support the original hypothesis.

SKILLS CHECKLIST

K-3

SKILLS CHECKLIST
K-3

	GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
I. Life Science:						
1. Identify shapes, sizes, and textures of common objects by using the sense of touch.						
2. Identify colors, shapes, sizes, textures and locations of common objects by using the sense of sight.						
3. Identify some common sweet, sour, and salty foods by using the sense of taste.						
4. Identify some common foods and materials by using the sense of smell.						
5. Identify some everyday environmental sounds.						
6. Identify which sense or senses are used to make an observation.						
7. Differentiate between like and unlike feels, tastes, smells, sounds, and sights.						
8. Identify living and nonliving things.						
9. State that living things can grow, move, need air, water, and food.						
10. Classify things as living or nonliving on the basis of observable characteristics.						

SKILLS CHECKLIST
K-3

	GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
11. Tell that there are many different kinds of animals including man.						
12. Classify animals into three categories--farm, pet, zoo.						
13. Classify land, air, and water animals.						
14. Classify animals according to size.						
15. Classify animals according to different body coverings--fur, feathers, shells, and skin.						
16. Identify the many places in which animals live--water, ground, nests, etc.						
17. Tell the similarities and differences between baby animals and their mothers.						
18. State that animals need food, water, and shelter.						
19. Identify and place in the correct order stages in the life cycle of animals.						
20. Classify animals according to vertebrates and invertebrates.						
21. Identify water and sunlight as necessary elements for healthy plants.						
22. State that some plants have seeds.						

SKILLS CHECKLIST
K-3

		GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
23.	State that a seed is a living thing and can grow into a plant.						
24.	Identify the different parts of a seed--covering, baby plant, and food source.						
25.	State that seeds need water and warmth to sprout (germinate) but that they do not need light.						
26.	Identify plant parts including the leaves, roots, stems, flowers, fruits, and seeds.						
27.	State that some plants produce seeds inside of their fruit.						
28.	State that different parts of a mature plant (roots, stems, leaves) grow into a new plant.						
29.	State that the roots of plants grow down while the stems and leaves grow up.						
30.	Identify different kinds of plants in their community.						
31.	Classify common plants according to similarities and differences.						
32.	Explain the importance of seeds and plants as a source of food.						

SKILLS CHECKLIST
K-3

	GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
II. Earth Science:						
1. State that soil is made up of different things.						
2. Explain that soil is different in different places.						
3. Define erosion as the blowing or washing away of soil and describe how it can be prevented.						
4. Describe changes in the weather.						
5. Identify different kinds of weather.						
6. Identify characteristics of each season.						
7. Name and place in order the different seasons.						
8. State that wind is moving air.						
9. Identify the sun as the source of light in the day sky and identify the moon and the stars as sources of light in the night sky.						
10. Identify Earth as the planet on which they live.						
11. Identify the earth, moon, sun, and stars as bodies in space.						

SKILLS CHECKLIST
K-3

		GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
12.	State that Earth and the moon are shaped like a ball.						
13.	Define a day in terms of rotation.						
14.	Explain why the moon appears larger than the stars and other planets.						
15.	Explain why the sun appears larger than the other stars.						
16.	Identify the moon as a natural satellite of Earth.						
17.	Explain that the moon is visible only because it reflects light from the sun.						
18.	State that the moon goes through a series of phases as it orbits the earth.						
19.	Identify in sequence the nine planets of the solar system.						

SKILLS CHECKLIST
K-3

	GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
III. Physical Science:						
1. Identify objects as being up-down, far-near, inside-outside, over-under, between-around, top-bottom, next to-beside other objects.						
2. Explain how sound can be made.						
3. Identify loud and soft sounds, high and low sounds, and long and short sounds.						
4. Identify sounds that have different meanings--telephone, siren, clock, laughter, etc.						
5. Identify sources of light.						
6. Explain that light is needed to see.						
7. State that shadows are made when light cannot pass through objects.						
8. State that air takes up space.						
9. State that air has mass.						
10. State that air exerts pressure.						
11. Define matter as occupying space and having weight.						
12. State that a solid has a definite shape.						

SKILLS CHECKLIST
K-3

		GUIDE PAGE NO.	BASAL PAGE NO.	K	1	2	3
13.	State that a liquid takes the shape of its container.						
14.	State that gas takes the shape of its container.						
15.	Classify substances as solids, liquids, gases.						
16.	Identify three sources of heat.						
17.	Identify ways in which heat helps people.						
18.	Define temperature.						
19.	Identify a thermometer as an instrument used to measure temperature.						
20.	Identify changes in temperature by observing a thermometer.						
21.	Define a magnet as an object that attracts materials containing iron.						
22.	State that magnets can be found in many sizes and shapes.						

CURRICULUM STANDARDS

K-3

AREA: SENSES
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Identify shapes, sizes, and textures of common objects by using the sense of touch.	Sense of touch	Observing, inferring, communicating	A. Place objects of various sizes and shapes in a "feel" bag or box. Have a child select an object and describe and identify it. B. Place objects of various sizes and shapes in a "feel" bag or box. Have one child select an object and have other children try to identify object by asking questions. C. Blindfold children and let them feel and identify common objects (or classmates).
2. Identify colors, shapes, sizes, textures and locations of common objects by using the sense of sight.	Sense of sight	Observing, classifying, communicating	A. Play "I Spy" with children. "I see something you don't see." (Child describes object to class.) B. Classify various materials as to texture, color, size, shape, etc.
3. Identify some common sweet, sour, and salty foods by using the sense of taste.	Sense of taste	Observing, classifying, communicating	A. Write "sweet," "sour," and "salty" on blackboard. Put a picture representative of each next to the word. Give children samples of food to taste. Have them classify foods according to taste.

AREA: SENSES
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Have children close eyes and hold nose. Taste different foods and try to identify.
4. Identify some common foods and materials by using the sense of smell.	Sense of smell	Observing, communicating, inferring	A. Place food in closed boses. Punch a hole in each bos. Have children identify foods using sense of smell. (Some foods must be broken up.) B. Have children close their eyes and take an imaginary walk. Let their faces express what they feel about some smells. (Skunk, burning leaves, flower garden, popcorn in a theater, food burning in the oven) C. Dip cotton swabs into clear liquids (bleach, orange juice, apple juice, perfume). Place cotton into jars or vials. Have children open jars, one at a time, and identify smells. Note: Some children may be "smell-blind."
5. Identify some everyday environmental sounds.	Sense of hearing	Observing, communicating, inferring	A. Have children stand in the back of the room with their eyes closed. Make various sounds (sharpening pencil, crumpling paper, opening window, pouring water, etc.). Have children identify sounds. B. Tape record different sounds around the community, classroom, house, etc. Have children identify sounds.

AREA: SENSES
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
6. Identify which sense or senses are used to make an observation.	Sense of hearing	Observing, communicating, inferring, classifying	A. Allow one child to choose an object in the classroom and describe it to the other children. Discuss the senses used to describe the object.
			B. Make a "sense" box using a balloon partially filled with water and tied shut, a peanut or small rock, and a piece of onion. Place all three objects in a box and tape shut. Have children use all their senses to find what is in the box. (Students may "feel" inside of box.) Have children explain how they arrived at their answers.
			C. Have children watch corn popping. Discuss observations in terms of what was seen, heard, and smelled. Have them touch, taste (and eat) popcorn. Discuss how the popcorn felt and tasted.
			D. Make a cut-and-paste chart of pictures for each sense, for example, pictures of objects that can be tasted, smelled, seen, touched, and heard.

AREA: SENSES
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
7. Differentiate between like and unlike feels, tastes, smells, sounds, and sights.	Senses	Observing, communicating	A. Touch--using a tactile board, children will match such textures as sandpaper of varying fineness, burlap, velvet, wood, vinyl, formica, etc. B. Taste--With eyes closed, children will taste different foods and identify like and unlike flavors. With eyes open, children will taste similar looking foods, such as sugar and salt, peeled potatoes and apples, etc., and identify like and unlike flavors. C. Smell--Children will match smells in boxes with pinholes in the top. D. Sound--Children will match like sounds after shaking opaque vials with varying ingredients. E. Sight--Children will visually discriminate between like and unlike textures, designs, patterns, pictures, etc., using concrete materials and ditto materials.

AREA: LIVING-NONLIVING
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Identify living and nonliving things.	Some things are capable of life and others are not.	Observing, classifying, communicating	A. While taking a walk outside, the children will identify living and nonliving things. Be careful to differentiate the nonliving cement as opposed to a dead bug.
			B. Using a magazine, chart paper, scissors, and paste, the children will make a living chart and a nonliving chart.
			C. Mount pictures of living and nonliving things on cards. Let each student draw a card and tell whether the selected card is of a living or nonliving thing and explain why. Explanations should give characteristics of living or nonliving things.
			D. Feature a "Pet Rock" which might lead to a discussion of living and nonliving things.
2. State that living things can grow, move, need air, water, and food.	Characteristics of living things	Classifying, measuring, observing, inferring, communicating	A. Discuss with students that they are living things because they grow. Have the children compare their younger friends to themselves in terms of size and abilities. Have the children compare themselves to adults, particularly their parents.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Discuss that pets are living things and let the children relate stories about their pets that prove they are alive. Example: Pets move, eat, sleep, bark, etc. C. The children will compare young animals with full-grown animals and compare young animals to babies and young children. Note: Comparison may be easier for the children if done as listings and titled "How They Are Alike" and "How They Are Different." D. Cut the top off of a potato, draw a face on the potato and sprinkle the top of the potato (on the cut part) with birdseeds. Sprinkle with water and watch it grow as hair on a head. Compare to children's hair. For an individual activity each child may bring his or her own potato and make a face on it. E. Have children compare a baby plant with its mother. F. Have children plant seeds and measure and record the growth. (See appendix on measuring length.)

AREA: LIVING-NONLIVING
GRADE: K-3

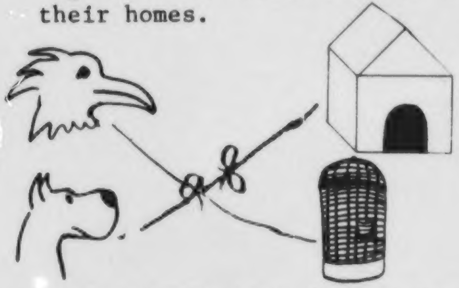
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
3. Classify things as living or nonliving on the basis of observable characteristics.	Classification of things as living and nonliving	Observing, classifying	A. Stack cards into stacks of "living" and "nonliving" things. (Use cards IC.)

AREA: ANIMALS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Tell that there are many different kinds of animals, including man.	Variety of animals	Observing, communicating	A. Have children bring pictures of animals, including man, and make a display.
			B. Using playdough or modeling clay, children will make given animals. Use models to make animals.
2. Classify animals into three categories--farm, pets, zoo.	Variety of animals	Observing, classifying, communicating	A. Let students name some farm animals, pets, and zoo animals, and classify them.
			B. Let pupils tell what kind of pet they have and list the different kinds shown on the board.
			C. Sing songs about animals such as "Old McDonald Had a Farm," etc.
3. Classify land, air, and water animals.	Variety of animals	Observing, classifying	A. Have children cut out magazine pictures of land, air, and water animals and paste the pictures on chart paper, thus making classification charts for each category.
4. Classify animals according to size.	Variety of animals	Observing, classifying, communicating	A. Let a student describe animals by size and let classmates guess what animals he is describing. Act out animals and let children guess. Example: Stretch on toes for tall animals, crouch for small animals, etc.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Place pictures of different animals on cards. Let students discuss as a class which animals are larger than the students, which animals are smaller than the students, and which animals are about the same size as the students.
5. Classify animals according to the different body coverings--fur, feathers, shells, and skin.	Variety of animals	Observing, classifying, communicating	A. Set up a picture display of a variety of animals and let the children tell how their body coverings differ.
			B. Using pictures or real pieces of body coverings, if possible, let children classify animal picture cards under the correct covering.
6. Identify the many places in which animals live--water, ground, nests, etc.	Variety of animals' habitats	Observing, communicating, inferring	A. Make two-piece puzzles where students match the animal with its home. (Example: bird and nest, dog and dog house, cat and basket, fish and water, bat and cave, etc.)
			B. Describe an animal's home and let the students guess what animal lives there.

AREA: ANIMALS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Let children tie the two strings together that match animals with their homes.  Note: If the knotted shoe strings on the backside of the board are color coded, the activity can become self-correcting.
7. Tell the similarities and differences between baby animals and their mothers.	Variability	Observing, classifying	A. Display pictures of mother animals and their babies. Lead students to determine which pair is being discussed by asking the following questions: 1. Which mother and baby are different because one has spots and the other does not? (deer) 2. Which are different because one has down and the other has feathers? (ducks, chickens, etc.) 3. Which are different because one has hair and the other does not? (mice) B. Match adult animals to baby animals, using picture puzzles.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Develop riddles that will aid in correctly naming baby animals. Example: I have four legs and a tail; my body is furry; my mother is a cat. What am I? (kitten)
8. State that animals need food, water, and shelter.	Needs of animals	Communicating, inferring, observing	A. Have children identify their own basic needs (food, water, shelter). Ask them to identify some animals and their needs.
			B. Keep a classroom pet. After several days, make a chart listing the things and care needed by the animal to live. (Refer to parish policy concerning classroom pets.)
9. Identify and place in the correct order stages in the life cycle of animals.	Life cycle	Experimenting, observing	A. Make chart with pictures showing stages in life cycles of the butterfly, frog, and youth to adult changes in other animals.
			B. Culture and maintain tadpoles. Observe changes in appearance as they mature.
10. Classify animals according to vertebrates and invertebrates.	Some animals have backbones. Some do not.	Classifying, observing	A. Place pictures of animals on cards. Sort according to vertebrates and invertebrates.

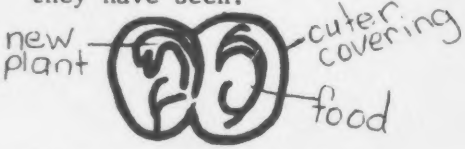
AREA: PLANTS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. Identify water and sunlight as necessary elements for health plants.	Plants need water and sunlight.	Observing, inferring, communicating, controlling variables, experimenting	A. Plant a seed in several clear plastic cups. Place one planted seed outside and give it proper care. Place the second planted seed outside but do not water it. Place the third planted seed in a sunny spot in the classroom and water. Place a fourth planted seed next to the third but do not water. Place a fifth planted seed in a dark spot in the classroom and water. Finally, place a sixth planted seed next to the fifth and do not water. Observe the growth of these plants and compare by answering the following questions: 1. Which plant died first? 2. Which plant needed the most water? 3. Which plant has the greenest, healthiest looking leaves? 4. What caused the dead plants to die? B. Set up an investigation where you have two baby plants. Water one daily. Make observations that without water a plant will die.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Some plants require less water than others. Some do well in the shade, but most plants require water and light to survive. Place a potted plant in a dark closet and a similar one in a sunny spot (preferably a lima bean plant). Examine the plants each day. The plant in the dark will not live long. It will grow too fast and lose its color. Plants cannot produce food without sunlight. On a bright day plants often make more food than they need. This surplus food is stored in the roots or other parts of the plant until needed. D. Using the dead plants from Activity A, dump them on the ground and observe how they return to the soil. Explain the life cycle. Note: This could be a good introduction to death education.
2. State that some plants have seeds.	Some plants have seeds.	Observing, classifying, inferring	A. Have students tear apart a flower and observe the seeds. B. Have two groups of plants--those with seeds and those without seeds. Open up the plants and find seeds.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Have children make charts of different kinds of seeds according to size, shape, color, texture, or covering.
3. State that a seed is a living thing and can grow into a plant.	Seeds are living things and can grow	Observing, measuring, inferring, communicating	A. Sprout bean seeds by keeping them wrapped in a damp paper towel. Use enough seeds so that children can observe each day and cut one seed in half. Discuss inward and outward signs of growth. B. Plant a bean seed, a corn seed, a marble, a rock. Which of these will grow? C. Provide a rapidly growing seedling, such as a bean, pumpkin, or tomato. Ask the following questions: 1. Is it alive? 2. How do we know it grows? 3. How do we know it is growing? Children may suggest measuring the seedlings. Insert a dowel pin or other stick beside the plant. Mark the stick every few days to record growth. See appendix on measuring length.

AREA: PLANTS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			D. Cut open different fruits and look at their seeds. E. The children will draw pictures of growing seeds in sequence. F. Using a ditto of sequential seed growth pictures in a scrambled order, the children will cut out and place in sequential order on a piece of paper.
4. Identify the different parts of a seed--covering, baby plant, and food source.	A seed has many parts.	Observing, communicating	A. Materials: Glass of water Lima beans Soak lima beans in the glass of water overnight. Peel off the outer covering. Open the soaked bean. Identify the new plant and the food for the new plant. Pupils draw a diagram of what they have seen. 
5. State that seeds need water and warmth to sprout (germinate) but that they do not need light.	Certain conditions are needed for plant growth.	Inferring, observing, communicating, experimenting, measuring, predicting, interpreting data	A. Materials: Soaked lima beans, clear jars or cups, wet blotting paper or paper towels, water

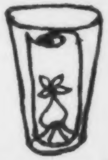
AREA: PLANTS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Place seeds in each jar that is lined with the blotting paper or paper towel. Put one jar in a warm, dark place and the other in a cold, dark place (refrigerator). Observe what happens. Have children compare wet and dry conditions. 1. Which seeds sprouted? 2. Which conditions were optimal for seed germination? B. Record and graph, over a period of several days, growth changes that take place in a seed as it sprouts. *See appendix on graphing. C. Ask the children to make a class chart (or individual charts) recording the following information: 1. Number of days it took the seed to germinate. (If a child wishes to dig up his seed to investigate the germination, let him.) 2. Number of days it took the germinating seed to emerge above the soil level. 3. Number of days the plant grew before it developed its first leaves.

AREA: PLANTS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			As the seeds develop into new plants and begin to grow above the soil level, depict the rate of growth of the plants on individual bar graphs. Students might use crayons, or cut strips of colored paper to be pasted on the graph showin the height each day. These can be called "growth strips." After they have observed and recorded the growth of a plant for a few days, they can begin to make predictions as to how much the plant might be expected to grow in a certain length of time--one day or more. Use metric units. *See Appendix on graphing and on measuring length.
6. Identify plant parts including the leaves, roots, stems, flowers, fruits, and seeds.	Plants have many parts.	Observing, communicating	A. Prepare cutouts of roots, stems, leaves, flowers, fruits, and seeds which can be mounted on cards and labeled with the name of the part. B. Using a drawing, have children identify the parts of a plant.
7. State that some plants produce seeds inside of their fruit.	Some plants produce seeds.	Observing, communicating	A. Encourage children to bring fruits to class. Observe the seeds from each fruit.
8. State that different parts of a mature plant (roots, stems, leaves) grow into a new plant.	Some parts of plants make new plants.	Observing, hypothesizing, controlling variables, experimenting	A. Bring parts of different plants to class. Experiment to see which will grow. (Include some such as cuttings that will grow.)

AREA: PLANTS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
9. State that the roots of plants grow down while the stems and leaves grow up.	Roots of plants grow down, stems up.	Observing, communicating, inferring	A. Have children place bean and corn seeds between a rolled up blotter and a glass. Keep moist. Conclude that roots grow downward and stems grow upward regardless of how seed is placed. 
10. Identify different kinds of plants in their community.	Variety of plants	Observing	A. Go on a nature walk and identify common plants. B. Have each child bring a plant from home (labeled). Observe.
11. Classify common plants according to similarities and differences.	Variety of plants	Observing, classifying	A. Bring in a variety of plants. Have the children classify the plants according to various characteristics.
12. Explain the importance of seeds and plants as a source of food.	Plants and seeds are important food sources	Observing, communicating	A. Ask children to recall what they ate for a previous meal. Which of these foods came from plants and seeds?

AREA: SOIL
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. State that soil is made up of different things.	Soil is composed of different things	Observing, inferring, communicating	A. Have children bring in soil samples. Keep a record of their soil samples. 1. Where did you find it? 2. What was the weather like? 3. What color is your soil? 4. How does it feel? Spread the soil out on paper. Look at it with a hand lens. Put the animals you find in a small jar. Make piles of the different things you find in soil. Make a chart to use in comparing soil samples. Child's Name Place Found Weather Color Feel Things in Soil (Tape these here on the chart.)

AREA: SOIL
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Ask: What is soil made of? (Answers will vary depending on samples.)
2. Explain that soil is different in different places.	Soil varies from one location to another.	Observing, inferring	A. Use chart to compare the soil samples. Ask: How are the soil samples alike? How are they different?
3. Define erosion as the blowing or washing away of soil and describe how it can be prevented.	Erosion	Observing, inferring, defining operationally	A. Have children fill two pans with soil. Make rows up and down in one pan. Make rows across in the other pan. Tilt the pans. Put the bottom of each pan in another pan. Now pour equal amounts of water on each pan. Which pan loses the most soil? Why? What can farmers learn from this? How should farmers plant their crops on a hill? B. Get two pans the same size. Put some dry soil in one pan. Put some soil with grass growing in it in the other pan. Put the pans in

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			front of an electric fan. Turn on the fan. What happens? Why? C. Put dry soil and grassy soil in the pans again. Tilt the pans so one end is higher. Spray equal amounts of water on the high end of each pan. What happens to the dry soil? What happens to the soil with the grass growing in it? How can you explain your observations?

AREA: WEATHER
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Describe changes in the weather.	Weather changes	Observing, classifying	A. To make a weather calendar, place a calendar on the bulletin board and have students paste pictures on the calendar that correspond to each day's weather (cloudy, sunny, rainy, hot, cold, etc.).
2. Identify different kinds of weather.	There are different kinds of weather.	Observing, classifying, communicating, predicting	A. To make a weather clock, cut a large circle of cardboard and place on the bulletin board. Attach two large black hands of the same length in the center of the circle. Separate the circle into eight wedges by drawing lines from the center of the circle. Put the words cold, rain, clouds, wind, snow, warm, dry, and sun on the wedges and find appropriate pictures to paste in each section. The children can adjust the hands to indicate the condition of the moisture and the temperature on a particular day. B. A temperature graph can be made for the bulletin board. The temperature can be

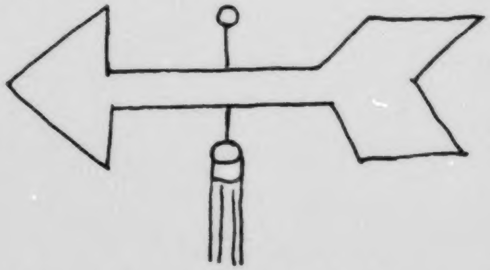
AREA: WEATHER
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			placed on the vertical scale in 5-degree intervals. Strips of construction paper can be used for the bars on the graph. The day of the month can be written on each strip of paper. After the children have kept records for several days, ask them to predict what they think will be the next day's temperature. *See appendix on graphing.
3. Identify characteristics of each season.	Characteristics of seasons	Observing, inferring, classifying	A. Using seasonal pictures, have students: 1. Pick the warmer seasons. 2. Pick the cooler seasons. 3. Pick the season with snow. 4. Pick the season when leaves change, etc. B. Given paper dolls, have the students dress them in the appropriate clothing for each season. C. Using pictures from magazines, students can make separate charts for each season to be represented.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			D. As weather changes, discuss how clothing and activities also change. Ask the following questions: 1. What do you wear in rainy weather? 2. When do you swim? Note: It would probably be easier for children to understand weather changes and different kinds of weather if related to personal and familiar experiences.
4. Name and place in order the different seasons.	Seasons	Observing, classifying, space/time relationships, communicating	A. Using seasonal pictures from 3A, place the pictures in sequential order. B. Have the children discuss their favorite time of the year. Group the children according to their favorite season and have them make a wall mural of seasons in sequence. Their murals might include plants, seasons, animals, and themselves doing their favorite seasonal activity.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
5. State that wind is moving air.	Wind is moving air.	Observing, communicating, inferring, classifying	A. Make soap bubbles and blow outside. Watch moving air blow them. B. Put a letter inside a balloon instructing the finder to mail it back to school and note the location at which it was found. Have the children watch the balloon fly away. When the letter is returned, discuss how the letter got where it was found in terms of the wind helping to move the balloon. Also discuss the location at which it was found in terms of the children's homes or other familiar landmarks. C. Give children a crepe paper streamer and have them walk outside on a windy day. Suggest that they hold the streamers by one end and observe how the wind moves them. Encourage the children to think of other ways to hold the streamers--in the center, high in the air, near the ground, etc.

AREA: WEATHER
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			D. Take a walk outdoors and ask the children to list things moved by the wind (dust, flag, paper, leaves, etc.) and things that move by their own power (birds, planes, helicopters, etc.). E. Wind Vane Materials: Drinking straws, pins, paper clips, pencils, rubber bands, construction paper, and paste  On a day with a steady breeze, take the wind vanes outdoors away from the building and hold the wind vanes high. Remind the children that a good wind vane turns easily, readily showing changes in wind directions.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			The area of the tail is larger than that of the head so that the wind exerts more force on it than on the head. The tail extends farther from the pivot than the head. Even if the force on it were the same as on the head, the turning effect would be greater. Use weight in the head in order to balance the larger tail. The tail may be double and spread apart slightly to make the vane steadier. 1. Why do some turn more freely than others? 2. What makes some stay level and others keep one end low? 3. Why do some point with the wind instead of into it? 4. Why do some turn sideways to the wind?

AREA: SOLAR SYSTEM
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. Identify the sun as the source of light in the day sky and identify the moon and the stars as sources of light in the night sky.	Sources of light for day and night	Observing, communicating, inferring	A. Have children draw a picture of day and one of night. Compare them and discuss that to have light they have to draw a sun in the day sky and a moon and stars in the night sky.
			B. Turn lights off in classroom on a sunny day. Turn lights off in classroom on a cloudy day. Discuss the difference and ask the question: Why is it darker on a cloudy day?
			C. Using a globe and unshielded light bulb to represent the sun, turn globe to demonstrate how the sun lights the earth.
			D. Have children draw a picture of night using black construction paper to represent night and white chalk for the drawing of the moon and stars.
			E. Put light bulb in box with one side covered with black

AREA: SOLAR SYSTEM
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			construction paper with star cutouts and circle cut for the moon. Turn light bulb on and point out the light coming through the cut-out stars and moon.
2. Identify earth as the planet on which they live.	We live on planet earth.	Observing, communicating	A. Children may make a model or mural of the solar system. Have them label only the planet earth. (At this stage, names, relative sizes, and distances between planets need not be emphasized.)
3. Identify the earth, moon, sun, and stars as bodies in space.	The sun, moon, and stars are bodies in space.	Observing, inferring	A. Have students take an imaginary trip in space, leaving earth and encountering the moon, sun, and stars.
4. State that earth and the moon are shaped like a ball.	The earth and moon are round.	Observing, inferring	A. The teacher should provide the following materials: 1. Some of the pictures available from the space program showing earth and the moon from different angles and distances as viewed by astronauts in space or astronomers on earth. 2. Globe situated someplace in the classroom.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Using the above materials, discuss the pictures. Suggested questions: 1. What are these objects? 2. Do we have anything here in the classroom that looks like these objects in space (globe, ball, etc.)?
5. Define a day in terms of rotation.	Earth's rotation causes day and night.	Observing, inferring	A. Use a flashlight and a globe to demonstrate day and night.
6. Explain why the moon appears larger than the stars and other planets.	The moon is closer than the sun and stars.	Observing, hypothesizing, inferring	A. Have the child hold a penny only one inch from his eye. At the same time have a boy or girl hold a ball at a distance of 6 feet from the penny. Then instruct the viewer to move the penny away from his eye. Tell him to stop moving the penny at the time the ball comes into view. Then ask which looks larger, the penny or the ball. Guide the children to conclude that things close look big. The penny looks bigger than the ball when it is close to the eye.

AREA: SOLAR SYSTEM
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
7. Explain why the sun appears larger than the other stars.	The sun appears larger because it is closer than other stars to the earth.	Observing, inferring, hypothesizing	A. Refer to 6A.
8. Identify the moon as a natural satellite of earth.	The moon is a satellite of the earth.	Observing, inferring, predicting	A. Have children observe the moon for 28 days. Have them record its shape and location in the sky at the same time each evening.
			B. The moon is a satellite of earth because it travels around earth. Put a globe on a chair. Have a volunteer walk around the "earth" as if he were the moon in orbit.
9. Explain that the moon is visible only because it reflects light from the sun.	The moon shines because of reflected light from the sun.	Observing, inferring	A. To help the children understand how sunlight is reflected to earth by the surface of the moon, use a mirror to reflect sunlight coming in through a window. Reflect the light onto various parts of the walls and the ceiling of the classroom.
10. State that the moon goes through a series of	Phases of the moon	Observing, communicating	A. Refer to 8A.

AREA: SOLAR SYSTEM
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
phases as it orbits the earth.			
11. Identify in sequence the nine planets of the solar system.	Sequence of planets	Observing, communicating	A. Using styrofoam balls of various sizes, have children construct a solar system. B. Have children listen to and learn the following poem: Here we go round the sun. In space our work's never done, Mercury, Venus, Earth, Mars, who else goes round the sun? Jupiter, Saturn do Uranus, Neptune, Pluto, too. As neighbors in space we number nine. Here we go round the sun. C. Mnemonic device to learn the planets in sequence. My Very Educated Mother Just Served Us Nine Pizzas. Note: Pluto is presently inside Neptune's orbital path.

MINIMUM STANDARDS

PHYSICAL SCIENCE

K-3

AREA: CHANGE-SPACE RELATIONS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The Student will be able to:			
1. Identify objects as being up-down, far-near, inside-outside, over-under, between-around, top-bottom, next to-beside other objects.	Time/Space	Observing, classifying, using space/time relationships	UP-DOWN A. Use pictures to demonstrate up-down movements (elevators, escalators, stairways, ladders, slides, balloons, etc.). Have the children decide which picture shows downward movement and which picture shows upward movement. B. Bouncing balls move up-down. The children can show this movement with their hands while saying "up-down." C. Play see-saw. D. Have children hold up one leg and put it down; lift one hand and put it down; bend their body and then straighten up. E. Give each of the children an object and ask them to hold the object up, down, up a little, down a little, up as high as possible, down as far as possible without touching the floor.

AREA: CHANGE-SPACE RELATIONS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			FAR-NEAR A. Play a game of instructions-- "move near the window, "move away from the window," etc. B. Have the children think of places near and far from their homes. C. Ask the children to choose objects in the room and tell whether they are near or far from them. D. Give each child an object. Ask the child to move the object near and far in relation to himself/herself. Move object near and far in relation to other objects. INSIDE-OUTSIDE Using a hoop, the children will step inside of it and then outside of it, as directed. Place an object inside of the hoop and outside of the hoop.

AREA: CHANGE-SPACE RELATIONS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			OVER-UNDER Two children will hold a jump rope in the air while the other children jump over and run under the rope.
			BETWEEN A. Children will move between other objects and other children. B. Children will move objects between other objects.
			AROUND A. Children will move around objects and other children. B. Children will walk their fingers around other objects. C. Children will draw circles around pictures, numerals, etc., on paper or on chalkboard.

AREA: CHANGE-SPACE RELATIONS
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			TOP-BOTTOM A. Children will point to the tops and bottoms of objects and place objects on top of other objects (book on book, hat on head, etc.). B. Children will move from top of stairs, monkey bars, etc., to bottom as directed. NEXT TO-BESIDE A. Children will move next to other children or objects. B. Children will move objects next to other objects. C. Children will lay objects beside other objects.

AREA: SOUND
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Explain how sound can be made.	Sound is produced and transmitted by vibrating matter.	Observing, inferring	A. Have available different musical instruments and resource persons such as band directors.
2. Identify loud and soft sounds, high and low sounds, and long and short sounds.	Differences in sound	Observing, inferring	A. Draw the edge of an index card over a comb at different speeds. The faster the index card moves against the teeth, the faster it vibrates and the higher the sound becomes. B. Obtain a cigar box, remove the cover, and cut three grooves on each edge of the box. Stretch three rubber bands of equal length but different thicknesses lengthtwise around the box, placing them in the grooves to keep them in place. Pluck each band, and note that the thinner the band, the higher the sound will be.

AREA: SOUND
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Using various levels of water in glasses, produce several sets of sounds varying in pitch. In each set the children will identify the higher or lower sound as instructed (rubber bands, ruler).
			D. Produce several sets of sounds varying in length using a whistle or bell. In each set, the children will identify the longer or shorter sound as instructed.
			E. Following directions given by the teacher, the children will respond by making either loud or soft, high or low, long or short sounds.
			F. Have students close their eyes and play Simon Says reproducing the clapping patterns made by teacher.
3. Identify sounds that have different meanings--telephone, siren, clock, laughter, etc.	Sounds have different meanings	Observing, communicating, interring	A. Listen to recorded sounds or have children make sounds that have different meanings (baby's cry, siren, clock, laughter, etc.).

AREA: SOUND
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Have students identify sounds: 1. Pleasant--noisy 2. Warning sounds 3. Happy sounds--sad sounds C. Have pictures of things that produce sounds that have meanings (telephone, door bell, alarm clock), and ask children to tell why that sound is important.

AREA: LIGHT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Identify sources of light.	Sources of light	Observing, classifying, communicating, inferring	A. Bring sources of light to school (flashlight, lamp, candles, etc.) for students to observe. Have students name other sources of light or bring pictures cut from magazines that show sources of light.
			B. Identify the sun as a source of light. Turn off classroom lights. Observe. Cover windows. Observe difference. Did the sun give light to the room before the windows were covered? Try this again on a very cloudy day. Note differences.
2. Explain that light is needed to see.	Importance of light	Hypothesizing, communicating, inferring	A. Discuss what life would be like without light. Have students tell how they use light.
			B. To emphasize light, blindfold children and encourage them to try to move around the classroom. Take blindfolds off and discuss: (1) without light there

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			would be darkness, (2) darkness as if blind, (3) how we use light, and (4) how would life be without light.
3. State that shadows are made when light can not pass through objects.	Light causes shadows	Observing, communicating, inferring, space/time relationships, defining operationally	A. Have children observe which how they cast shadows. Have one child stand in a sunny place where he can cast a shadow. Ask the children to try to explain how the shadow is made. Does the sunlight pass through the child's body? How can you tell? B. Set up a filmstrip projector and let students make some shadows by holding their hands in front of the light. Let them try making animal shapes. C. Have children stand in a shady area. Ask them to look for their shadows. What happened to them? Why did they have a shadow in the sun but not in the shade?

AREA: LIGHT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			D. Play "Step On My Shadow." Play this outside on a sunny day. Have the children pair up. Tell them that the object of this game is to keep their partner from stepping on their shadow. When the partner steps on his partner's shadow, it is his/her turn to do the same.
			E. Set up overhead projector to shine on blackboard (or on any smooth surface). Tape a piece of construction paper on the board. Sit child on chair high enough to block light and cause a shadow on the paper. Trace the child's shadow outline and make a silhouette. The child can cut out the outline, paste it on contrasting colored construction paper, and take it home as holiday gift.

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. State that air takes up space.	Air occupies space	Observing, inferring, communicating, experimenting, predicting	A. Give each child a plastic drinking straw. Direct the children to blow through the straw and discuss by asking the following questions: 1. What are you doing with your straw? 2. Can anything be seen coming out of the straw? Lead the children to the idea that air is invisible.
			B. Use a milk carton. Hold the open end near your face squeeze it. What happens? Now try bits of paper on a table. Squeeze the carton and see what happens. Explain the results.
			C. Place a book on top of a sealed ziplock plastic bag filled with air. Discuss what happens by asking the following questions: 1. Did the book fall off? 2. Does the bag act like a pillow? 3. What is inside the bag?

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			4. What will happen if you open the bag and then put the book on it? D. Give each child a water and liquid detergent mixture in a cup, and a straw which has four ½-inch slits in one end. Instruct the children to dip the cut end of the straw into the liquid, remove the straw, and blow gently into the uncut end. Discuss by asking the following questions: 1. What makes the bubble grow larger? 2. What makes the bubble burst? 3. What happens when you blow hard? 4. What happens when you blow softly? 5. Is the bubble large or small when you blow softly? 6. What is inside the bubble? E. Give children a paper bag and ask them to make the bag larger. Find those who have blown the bag up and

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			ask the following questions: 1. How did you make the bag larger? 2. What pushed out the sides of the bag? Invite the children to pop their bags and explain that the popping sound is partially caused by the air rushing out of the bag. F. For this experiment you will need a shoe box, tissue paper, tape, and scissors. Cut a hole in the middle of one of the small ends of the box. Cut a strip of paper 1 inch longer than the box is high and a little wider than the hole. Place the strip of paper over the hole with one end folded over the top edge of the uncovered box. Tape the tissue to the box on the inside. Fringe the free end of the tissue by cutting. Cover the box and tape closed. Let the children peek through the hole to see that nothing is inside of the

AREA: AIR
GRADE: K-3

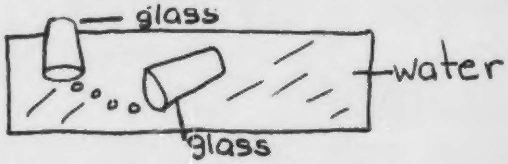
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			box. Direct a child to squeeze the sides of the box with sharp, short squeezes. Ask the following questions: Why does the paper flutter when the box is squeezed? Suggest that something is being pushed out of the box that is making the paper flutter. Ask the following question: What is being pushed out? G. Given a dishpan 2/3 full of water and a plastic bottle with a narrow neck, the child will immerse the bottle slightly tilted. After a moment of observation, discuss the findings by asking the following questions: 1. What is coming out of the bottle? 2. What is making the bubble?

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY

3. What happens to the bubbles when they come to the top of the water?
4. Do the bubbles burst?
5. Do they go into the air?

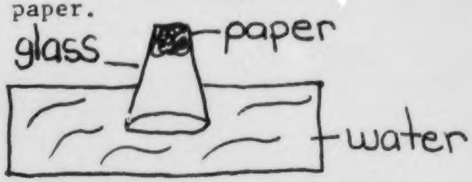
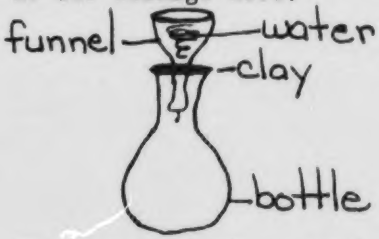
H. Turn an empty glass upside down and push it straight down into the water until it is completely covered. Tip it slightly.



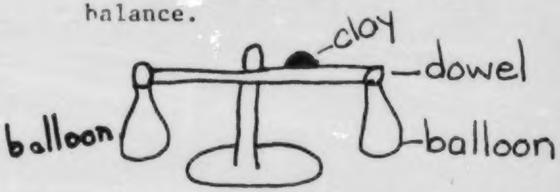
Ask the following questions:

1. What did you observe?
2. What causes the bubbles to form?
3. What happens inside the glass as it is tipped and more and more bubbles are released?
4. Using two glasses and the water container, can you find a way to pour air from one glass into another so that air goes from one glass to another?
5. What does this show about air?

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			I. Crumple a piece of paper and wedge it far inside the glass. Turn the glass upside down and slowly lower it straight down into the water without tipping it. Predict what will happen to the paper.  J. Place a funnel in a bottle opening and seal carefully with clay. There must be no air leakage here.  Pour water slowly into the funnel and ask the following questions: 1. What did you observe? 2. Why did very little water enter the bottle?

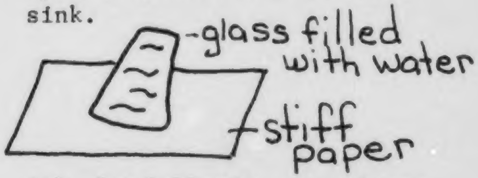
AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Pour water into the funnel until it rises almost to the top and ask this final question: 3. What might be done to allow water to go into the bottle?
2. State that air has mass.	Air has mass	Observing, hypothesizing, predicting, inferring, experimenting	A. Does air weigh anything? Look at the picture of the balance.  How is the balance like a seesaw? Using the materials on your table, make a balance like the one above. Is the dowel balanced? If so, how can the clay ball be used to balance the dowell? Can you think of a way the balance and the balloons can be used to see if air has mass? Did your experiment make one end of the dowel move up or down? How can you explain your observation? Can you think of ways

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			to make the balloon balance again. *See appendix on measuring weight.
3. State that air exerts pressure.	Air exerts pressure	Observing, inferring, predicting, hypothesizing, experimenting	A. Give each child a piece of paper 5 x 8 inches with the two long sides folded about 1 inch from the edge. Instruct the children to place the paper on their desks so it stands up like a little table and then try to lift the paper by blowing under it. Ask the following questions: 1. What happens? 2. Does blowing lift the paper? Explain that the harder the children blow, the lower the paper will bend. Air is like a pile of blocks. Above the paper is a pile of air. When you blow under the paper, the air moves fast and not enough air is left under the paper to hold up the air above the paper. Blowing under the paper is like moving the bottom block of a pile of blocks. Try it and see what happens.

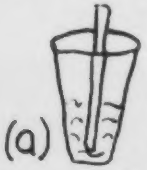
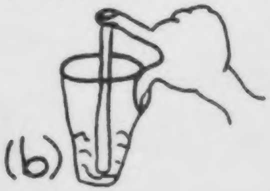
AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Make a hole in the bottom of a cup. Place a sheet of paper on a table. Set the cup on the paper with the bottom up. Suck through the hole. 1. What happens to the paper? 2. What holds the paper up? 3. When you suck the air from the cup where is the air pressure the strongest--on the inside or outside of the cup? How do you know this? C. Fill a drinking glass to the very top with water. Cover the glass with a piece of stiff paper. Hold the paper against the top of the glass and turn the glass upside down over a bowl or sink.  -glass filled with water -stiff paper Ask the following questions:

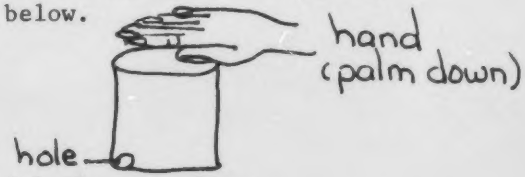
AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			1. What do you predict will happen when you release your hand from the paper? 2. What did you observe? 3. How can you explain your observation? 4. Do you obtain the same results when the glass is not completely filled with water? D. Fill a wide-mouthed jar with water. Cover the opening with a cardboard square, quickly turn the jar upside down, and set it down in about an inch of water in a pan. Take away the cardboard square. Allow the mouth of the jar to rest on two pencils or four balls of clay in the water. Ask the following questions: 1. What happens to the water in the jar? 2. How can you explain your observations? Remove some of the water from the pan with your straw. Ask the following questions:

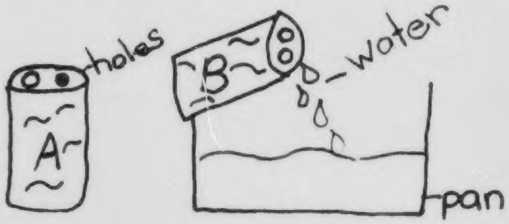
AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			1. What happens to the water in the jar now? 2. From this activity, can you design a drinking fountain for a family pet? E. Dip the straw vertically into the water as in the picture below (a). Lift it straight out as in the picture below (b).   After doing this ask the following question: What happened to the water inside the straw? Dip the straw again but now place a finger over the top end of the straw before lifting it out as in the picture above (b). Ask the following questions:

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			1. What happened to the water inside the straw this time? 2. How can you explain your observation? 3. How can a soda straw be used to remove small food and waste materials from an aquarium? F. Using a large nail, make a hole near the bottom of the can as shown in the picture below.  Ask the question: What do you think will happen when the can is filled with water? Fill the can with water. Ask the question: What happened to the water? Place your hand tightly over the top of the can and ask

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			the following questions: 1. What happened to the water? 2. How can you explain your observation? G. Using the hammer and nail, punch two holes in the top of a tin as shown in figure A. Seal any other holes with clay. Fill the can with water. Tip the can into a pan or sink as shown in figure B.  Ask the following questions: 1. How easily did the water flow out of the can? 2. How easily did the water flow out of the can when one of the holes was sealed with clay? 3. How can you explain your observation?

AREA: AIR
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			4. Why do opened cans containing liquids often have two holes punched in the top? In Activity F, air pressure prevents or slows down water from leaving when only one hole is made. A second hole permits air to enter the can and neutralize this effect.

AREA: MATTER
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Define "matter" as occupying space and having weight.	Matter occupies space and has weight	Measuring, observing, operationally defining	A. Using a book, a drinking straw, and a chalkboard eraser, have the children arrange the items in order from lightest to heaviest. After this review, separate the children into groups and provide each group with an equal-arm balance. Also give each group an identical collection of small objects to be weighed (toy cars, washers, bolts, nuts, small cubes, bar magnets, hand lenses, etc.). Some objects should weigh the same or nearly the same. Ask the children to compare and order the assorted objects by using a balance. *See appendix on measuring weight.
2. State that a solid has a definite shape.	Solid	Observing	A. Have students bring in small objects and trace them.
3. State that a liquid takes the shape of its container.	Liquid	Observing, inferring	A. Take one cup of water and pour it first into a glass, then into a square container, and finally into an oval-shaped container. Children should infer that the liquid always takes the shape of its container.

AREA: MATTER
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
4. State that gas takes the shape of its containers.	Gas	Observing, inferring	A. Have children blow air into paper sacks, plastic sandwich bags, and balloons. Have children describe the various shapes that the gas has taken. What shapes does a gas have (the shape of its container)? Have children identify other "containers" containing air (bicycle tires, football, etc.).
5. Classify substances as solids, liquids, or gases.	Matter exists in various forms.	Observing, classifying, communicating, inferring	A. When shown pictures of objects (shoe, water, steam from a pot, etc), children should identify them as solid, liquid, or gas.
			B. Give children three sheets of newsprint. Have them copy the words solids, liquids, and gases at the top of each sheet of paper, one word on a page. Then have them paste pictures from magazines or draw pictures representing examples of the word at the top of the page.

AREA: HEAT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. Identify three sources of heat. a. Sun b. Fuel c. Friction	Heat comes from many sources.	Observing, inferring, experimenting, interpreting data, communicating	A. Walk outside on a sunny day. Feel the warmth of the sun. Discuss how it feels. Move into the shade. Feel and discuss the difference. B. Place a thermometer in the classroom and one outdoors in the sun. Have students read the thermometer in the room, and then go outside to compare the temperature recorded on the thermometer outside. Ask the students what causes the differences in the temperatures. C. Light a candle. Let the children feel the warmth of the fire by cupping their hands around the flame. D. Have on hand an electric lamp, overhead projector, record player or other electrical appliances. Demonstrate that before these things are plugged into a wall outlet they are cold. Then demonstrate that through electricity these things become hot.

AREA: HEAT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			E. On an alcohol burner or hot plate place a small jar of water with a thermometer in it. Have students observe that as the water heats the temperature rises. F. Have students rub their hands together briskly for a minute or two, and ask them to notice how hot it feels to do this. G. Have the children arrange pairs of identical objects; one pair is to be placed in sunlight and the other in shade. Be sure to include dark-colored and light-colored objects. Leave them long enough for the objects in the sunlight to become warm. Then have the children feel the objects in each set using the palms of their hands. Ask: How do they feel? Do both objects feel the same? Which of the two is warmer? What made it warmer? Wait another 5 minutes. Blindfold a child and let him touch two objects. Ask him: Which object was placed in the sunlight? How can you tell?

AREA: HEAT
GRADE: K-3

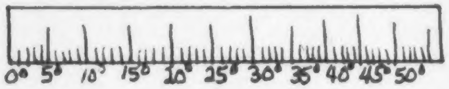
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
2. Identify ways in which heat helps people.	Heat helps people in many ways.	Observing, inferring, communicating	A. The sun is our chief source of heat. Demonstrate how it helps plants to grow by having the children grow seedlings in sunny environments.
			B. Have children observe that heat from fuel helps them to be more comfortable in cold weather.
			C. If a hot plate is available, cook something with the children so that they can observe and taste the difference in cooked and uncooked food. Discuss how heat is needed for cooking.
3. Define temperature.	The temperature of something tells you just how hot or cold it is.	Communicating, measuring, inferring, observing, defining operationally	A. To show that a thermometer measures temperatures, have two thermometers--one inside and one outside. Have children record temperatures inside and outside at various times of the day.
			B. Have children place one thermometer in a container of ice water and one thermometer in a container of boiling water. Prepare other solutions to test.

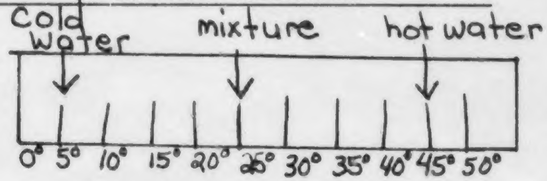
AREA: HEAT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
4. Identify a thermometer as an instrument used to measure temperature.	Temperature is measured with a thermometer	Observing, communciating	A. Give each child a Celsius or Fahrenheit thermometer. Have children examine their thermometers and describe the change when placed in environments of differing temperatures.
5. Identify changes in temperature by observing a thermometer.	Temperature is measured with a thermometer	Observing, measuring, predicting, communicating, using numbers, inferring, interpreting data	A. Each child will: 1. Note the room temperature mercury level of a thermometer. 2. Hold the thermometer in ice and observe the mercury drop. 3. Hold the thermometer in the palm of his/her hand and observe the mercury rise. Note: Small rubber bands can be placed around the thermometer at each of the three levels, thus allowing the children to more easily see the temperature changes. Discuss the direction and causes of mercury movements immediately following the foregoing activity and ask

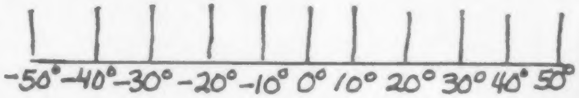
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			the following questions: a. Is the air warmer than your hand? b. Is the ice warmer than your hand? c. Is the ice cooler than the air? B. The children may need help or review in reading a thermometer. Project a transparency of a Celsius thermometer on an overhead projector. Make sure that the degree markings are clear. With a red marker, color in the thermometer tube so that the top of the red mark is on a numbered degree mark. Ask what degree is represented. Repeat until they can name the temperature quickly. Next, have the children practice naming the temperature when the top of the red stripe falls between two degree marks. When the top of the red stripe falls between two degree marks, read the number of degrees at the nearer mark.

AREA: HEAT
GRADE: K-3

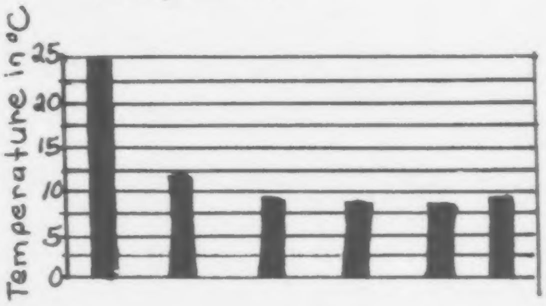
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Divide the children into groups of three. Give each child a thermometer and provide each group with three containers--one container with hot water (40 degrees to 50 degrees C), one container with cold water (0 degrees to 15 degrees C), and one empty container for mixing waters. Also give each group a ditto copy (see below) showing a series of number lines.  Have one child in each group measure and record on a numbered line the temperature of hot water and another the temperature of cold water. Have those two children simultaneously pour their water into the empty container. The third child should measure and record on the same number line the temperature of the mixture. Their data may be similar to that shown below.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			 cold water mixture hot water 0° 5° 10° 15° 20° 25° 30° 35° 40° 45° 50° Have them repeat the procedure several times with different temperatures of water. Ask the children to mark their results on the number lines; they should notice that the temperature of the mixture is halfway between the temperature of the hot and cold water (if the volumes of hot and cold water were the same). *See appendix on measuring volume. D. Group the children, and give each group a Celsius thermometer, a clear container one-quarter filled with crushed ice, and about 20 grams of table salt in a dry container. Have the children add some of the salt to the crushed ice, and then measure the temperature of the mixture. They will need to stir the mixture with their thermometer. Ask them

AREA: HEAT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			to find the lowest temperature they can get by adding salt to the container. (The lowest should be below 0 degrees Celsius.) You will now need to discuss a way to name a temperature colder than 0 degrees Celsius. Some should suggest degrees below 0. Distribute ditto copies of number lines similar to the one below.  Review with the children the term "negative number" and how to write a negative number. E. Divide the children into groups. Give each group a Celsius thermometer, an ice cube, and a container of about 100 ml of water at room temperature. The children will be putting the ice cube into the water and then measuring the temperature of the

AREA: HEAT
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			water every minute. *See appendix on measuring volume. Suggest that one child stir the water and ice mixture, one child call "time" every minute, and one child record the number of minutes and the temperature of the water without the ice cube. Then when the second hand reaches 12 on a wall clock, they should put the cube in the water. Each time the second hand reaches 12 again, they should read and record the temperature. Do this at least 5 minutes. They can then graph their data. (See picture.)  *See appendix on graphing.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Discuss their observations and their graphs. They should observe temperature change by naming initial and final temperature for time periods. They could find how many degrees the temperature changed. Key questions could include: 1. During which minute did the water cool most quickly? 2. When was the lowest recorded temperature? 3. Why did the water warm up? F. Have children record indoor and/or outdoor temperature one or more times daily over a period of days. Temperature readings may be placed on an ongoing graph kept on the classroom wall. *See appendix on graphing.

AREA: MAGNETISM
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Define a magnet as an object that attracts materials containing iron.	Objects containing iron are attracted to a magnet.	Observing, communicating, predicting, classifying, operationally defining	A. Have a large box containing a variety of objects. Label each object according to what it is made of (paper, glass, plastic, wood, steel, iron, aluminum, etc.). Give the children magnets and let them touch the objects with the magnets. After time for experimenting, ask the children what objects were attracted. B. The teacher can ask for a volunteer to find an object in the room to which the magnet will attract. The children will be able to experiment with the magnet and the many objects in the classroom (walls, windows, doors, teacher's desk, etc.).
2. State that magnets can be found in many sizes and shapes.	Magnets have different shapes.	Observing, communicating	A. Have different types of magnets for the children to use (bar, square, horseshoe, cylindrical). Have children test magnetic strength by dipping the end of each magnet into a pile of paper clips. Children may determine the strength of the

AREA: MAGNETISM
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			magnet by counting the number of clips picked up end-to-end. A graph can be constructed on the board to illustrate the strength of the different magnets. *See appendix on graphing.

SKILLS CHECKLIST

4-6

SKILLS CHECKLIST
4-6

	GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
I. Life Science:					
1. Identify the function of leaves in green plants.					
2. List sunlight, carbon dioxide, water, and chlorophyll as things a plant must have in order to grow and to make food.					
3. Identify at least three functions of roots in a plant.					
4. Identify a minimum of three functions of stems in a plant.					
5. Locate on a drawing the parts of a flower important in reproduction, e.g., petals, pistil, stamen, ovary, and pollen.					
6. Match flower parts with their functions.					
7. Explain the life cycle of a seed plant.					
8. Explain how plants reproduce without seeds.					
9. Describe the five main groups of vertebrates--mammals, birds, reptiles, amphibians, and fishes.					
10. Identify organisms as plant eaters, animal eaters, or both plant and animal eaters.					

SKILLS CHECKLIST
4-6

		GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
11.	Classify organisms as predator or prey.					
12.	Define a food chain as a series of animals feeding on other animals or plants.					
13.	Identify adaptations that aid in the survival of animals.					
14.	Describe some of the earliest animals and state how they have changed over long periods of time.					
15.	Identify reasons which explain the extinction of animals.					
16.	Name at least two animals that are in danger of extinction (bald eagle and brown pelican), describing the characteristics that make them vulnerable.					
17.	Define cells as the building blocks of the body.					
18.	Define tissues as cells of the same kind working together to do one job.					
19.	Define organ as a group of tissues working together to do a special job.					
20.	Define system as a group of organs working together to perform a bodily function or activity.					

SKILLS CHECKLIST
4-6

	GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
21. Identify the functions of the skeletal system as being protection, support, and movement.					
22. Distinguish between voluntary and involuntary muscles.					
23. Identify the major parts of the digestive system (mouth, esophagus, stomach, small and large intestine).					
24. Identify the major parts of the circulatory system (heart, blood vessels, blood).					
25. Identify the major parts of the respiratory system (nose, trachea, lungs).					
26. Identify the organs of excretion (lungs, kidneys, skin, large intestine).					
27. Identify the major parts of the nervous system (brain, spinal cord, and nerves).					

SKILLS CHECKLIST
4-6

	GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
II. Earth Science:					
1. Define minerals.					
2. Classify rocks into groups according to various properties (size, shape, color, texture, etc.).					
3. Identify the three groups of rocks (Sedimentary, Igneous, and Metamorphic).					
4. Describe how the earth's surface has been changed by weathering and erosion.					
5. Identify how mountains are formed.					
6. Explain the formation of a volcano.					
7. Identify the causes and characteristics of earthquakes.					
8. State how fossils are formed.					
9. Describe the composition of air.					
10. State that air contains water in the form of an invisible gas called water vapor.					
11. Tell the name of the process by which water changes to a gas (evaporation).					

SKILLS CHECKLIST
4-6

	GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
12. Tell the name of the process by which water changes from a gas to a liquid (condensation).					
13. State that a cloud is made up of tiny drops of water.					
14. State that fog is a cloud near the ground.					
15. Identify cirrus, stratus, and cumulus clouds.					
16. Identify the continuous movement of water from the earth's surface to the atmosphere and back to the surface of the earth as the water cycle.					
17. Identify the various forms of precipitation (rain, sleet, snow, and hail).					
18. Define weather.					
19. Tell the name of the instrument that measures changes in air pressure (barometer).					
20. Tell the name of the instrument used to measure rainfall (rain gauge).					
21. Identify humidity as the amount of water vapor in the air.					

SKILLS CHECKLIST
4-6

		GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
22.	Define the solar system.					
23.	Distinguish between rotation and revolution.					
24.	Define eclipse as the blocking of light from the sun by the moon or earth.					
25.	Identify the solar system as a part of a larger group of stars called the Milky Way Galaxy.					
26.	Identify a constellation as a group of stars.					

SKILLS CHECKLIST
4-6

III. Physical Science:	GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
1. Explain that sound is produced by vibrating matter.					
2. State that sound travels through solids, liquids, and gases.					
3. Compare and contrast how sounds travel through different media.					
4. Tell the word that means the highness or lowness of sound (pitch).					
5. Identify sounds (noise) that create problems in our environment.					
6. State that light travels in straight lines.					
7. Tell the name of the word that means the bouncing back of light (reflection).					
8. Classify objects as opaque, translucent, or transparent.					
9. Tell the name of the word that means the bending of light rays as they pass from one medium to another (refraction).					
10. Distinguish between concave and convex mirrors.					

SKILLS CHECKLIST
4-6

		GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
11.	Distinguish between concave and convex lenses.					
12.	State that white light is a mixture of all colors.					
13.	List the colors of white light in sequence--red, orange, yellow, green, blue, indigo, violet.					
14.	Compare the colors of the spectrum of white light with those of the rainbow.					
15.	State that certain parts (like poles) of a magnet repel each other while certain parts (unlike poles) attract each other.					
16.	Define North and South Poles.					
17.	Explain that by rubbing two different kinds of materials together, static electricity can sometimes be produced.					
18.	Diagram a complete circuit consisting of a dry cell, a bulb, and one wire.					
19.	Identify when a circuit is open and when it is closed.					
20.	Distinguish between conductors and non-conductors (insulators).					

SKILLS CHECKLIST
4-6

		GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
21.	Diagram a series circuit.					
22.	Diagram a parallel circuit.					
23.	State that electricity can be used to produce magnetism.					
24.	Identify and explain the function of simple machines.					
25.	Tell the name for machines made of two or more simple machines and give an example.					
26.	Distinguish between mass and weight.					
27.	Define density.					
28.	List the three states of matter and state examples of each.					
29.	Tell the name for the smallest particle of an element.					
30.	Name the three kinds of substances into which all matter can be grouped and explain how each kind of matter differs from the others (elements, compounds, and mixtures).					

SKILLS CHECKLIST
4-6

	GUIDE PAGE NO.	BASAL PAGE NO.	4	5	6
31. Identify the correct symbols for the following elements: H Hydrogen O Oxygen C Carbon S Sulfur N Nitrogen Fe Iron					
32. Recognize the chemical formulas for Water (H_2O), Salt (NaCl), Carbon dioxide (CO_2).					
33. State the boiling point and freezing point of water in both degrees Fahrenheit and degrees Celsius.					
34. Identify and differentiate between physical and chemical changes.					
35. Identify and differentiate among acids, bases, and neutral substances.					

CURRICULUM STANDARDS

LIFE SCIENCE

4-6

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Identify the function of leaves in green plants.	Leaves have a role in making food for green plants	Observing, inferring, predicting, experimenting, hypothesizing	A. Teacher information: tincture of iodine in the presence of starch changes from yellowish brown to dark blue. Take a green leaf and place it in a container. Cover the leaf with alcohol. Place the container in a pot of water and heat it until the leaf fades. NOTE: Since alcohol burns, do not boil it directly over a hot plate. Never use an open flame. To test the leaf for starch, remove some of the liquid and add a few drops of tincture of iodine. Discuss the following questions: 1. What did you observe? 2. What does this observation show?
2. List sunlight, carbon dioxide water, and chlorophyll as things a plant must have in order to grow and make food.	Photosynthesis	Controlling variables, experimenting, interpreting data, inferring,	A. What factors affect plant growth? Procedure: Divide the class into four experimental

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
		using numbers, communicating, predicting	groups. Have each group set up an experiment and record their observations. Group A: Coat the top and bottom of one or two leaves of a healthy geranium plant with vaseline. Keep the plant in a sunny location and observe after three days. Note: Leaves should turn yellow as no gases can enter or leave. Use at least three plants. Group B: Cover one or two leaves of a healthy geranium plant with aluminum foil. After three days students should observe leaves. Note: Leaves should turn yellow because no sunlight was available. Use at least three plants.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Group C: Cover a live geranium plant with a plastic bag and tie the bag securely around the stem. Inflate a second plastic bag by waving it through the air and tying off the open end. Place both the plant and the empty plastic bag in sunlight for 24 hours. Note: Water vapor will form on bag with plant. Use at least three plants. Group D: Put a water plant such as elodea in an aquarium filled with water. Invert a glass or plastic funnel over the plant and a test tube filled with water over the stem of the funnel. Set the apparatus in the sun for three days. Students should describe what happens. Note: Oxygen bubbles will be given off. Use at least three plants.

AREA: PLANTS
GRADE: 4-6

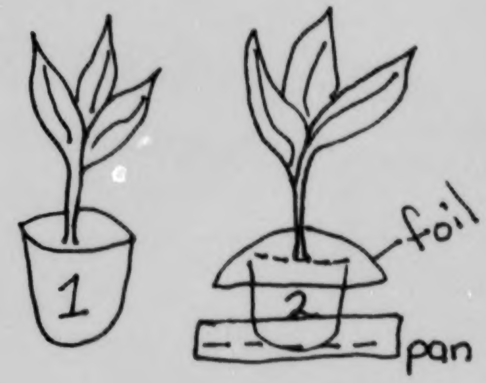
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			1. What do leaves need to stay healthy? 2. What do plants produce while in sunlight? Films or filmstrips on requirements for plant growth and photosynthesis. B. Materials for 2-3 pupil team: One healthy plant placed in bright light for the last 3-4 days; tincture of iodine (15 drops in a cup of water); two 2" by 2" squares of heavy tagboard or cardboard; four paper clips; hot plate; two tin cans, one large, one small (to fit inside the larger can); water; alcohol; tweezers. Procedure: Use the paper clips to fasten the two squares on the tip and bottom of a leaf from a healthy plant.

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Put the plant in bright light for three days (turn off the light at night when you go home). After three days remove the squares. IS THE PART OF THE LEAF THAT WAS COVERED BY THE SQUARES THE SAME COLOR AS THE REST OF THE LEAF? DO YOU THINK THAT YOU WILL FIND STARCH IN THE PART OF THE LEAF THAT WAS COVERED BY THE SQUARES? Test the leaf for starch by boiling the leaf in water, then in alcohol, and then dropping it into a cup of diluted iodine. DID BOTH THE COVERED AND UNCOVERED PARTS OF THE LEAF CONTAIN STARCH? HOW CAN YOU EXPLAIN YOUR OBSERVATIONS? FROM YOUR OBSERVATION, DOES THE GREEN MATERIAL IN THE LEAF SEEM TO BE IMPORTANT IN MAKING STARCH? FROM YOUR OBSERVATIONS, DOES LIGHT SEEM TO BE IMPORTANT IN MAKING STARCH?

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			DO ONLY LEAVES MAKE STARCH? DOES A POTATO CONTAIN STARCH? HOW DOES STARCH GET FROM THE LEAVES INTO THE POTATO? C. Grow some bean seeds in total darkness. Notice they have no green color and will soon die from lack of nutrients in the soil. Have children infer the role of light in the production of chlorophyll.
3. Identify at least three functions of roots in a plant.	Roots absorb water, anchor the plant, and store food.	Observing, inferring, predicting, hypothesizing, experimenting	A. WHERE DOES A PLANT USUALLY GET THE WATER IT NEEDS TO LIVE? WHICH PART OF THE PLANT TAKES IN THE WATER? During a rain, water falls on the leaves before it soaks into the ground. HOW DO YOU KNOW THAT THE LEAVES DO NOT TAKE IN WATER? CAN THE LEAVES TAKE IN WATER? CAN YOU PLAN AN EXPERIMENT TO FIND OUT?

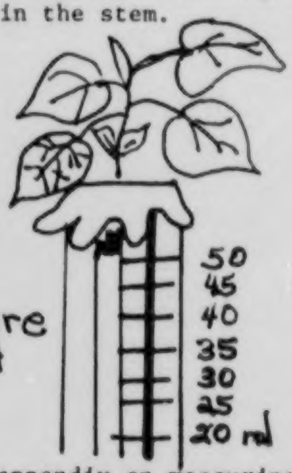
AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Use closely matched bean plants. Water the soil of Plant 1 as much as it needs each day or two. Keep a record of how much water you used on Plant 2. Water only the leaves of Plant 2 with the small amount of water. Keep the water from dripping into the soil. To do this, wrap waterproof foil around the bottom of the plant. Let it hang out over the sides of the pot as in the picture below. Put a tray or pan under the pot to collect the water that runs off. 

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			WHAT DIFFERENCES DID YOU OBSERVE BETWEEN THE TWO PLANTS? WHEN DID YOU FIRST SEE THE CHANGES TAKING PLACE? HOW CAN YOU EXPLAIN YOUR OBSERVATIONS? DO YOU THINK TWO PLANTS OF A DIFFERENT KIND (CORN, TOMATO) WILL SHOW THE SAME RESULTS? DOES PART OF THE PLANT GROW UNDER THE GROUND? WHAT IS THIS PART CALLED? WHAT DOES IT LOOK LIKE?
			B. Have children pull up some weeds of various kinds and bring them to school to examine and compare their root systems.
			C. Have children bring in and examine roots which are food sources such as carrots, beets, turnips, etc.
4. Identify a minimum of three functions of stems in a plant.	Functions of a stem are support, transport,	Observing, inferring, predicting, hypothesizing	A. To show that stems conduct water have small groups place a leafy stem in a 50 ml graduated cylinder and close

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
	and storing food		the top with aluminum foil or cotton to reduce evaporation. Have the pupils attach a narrow strip of masking tape along the side of the cylinder and mark the water level from time to time. (See Figure A.) Food coloring in the water may make it easier for them to see the drop in water level. They should infer that the dropping water level is accompanied by the rising of water in the stem. figure A  *Refer to appendix on measuring volume.

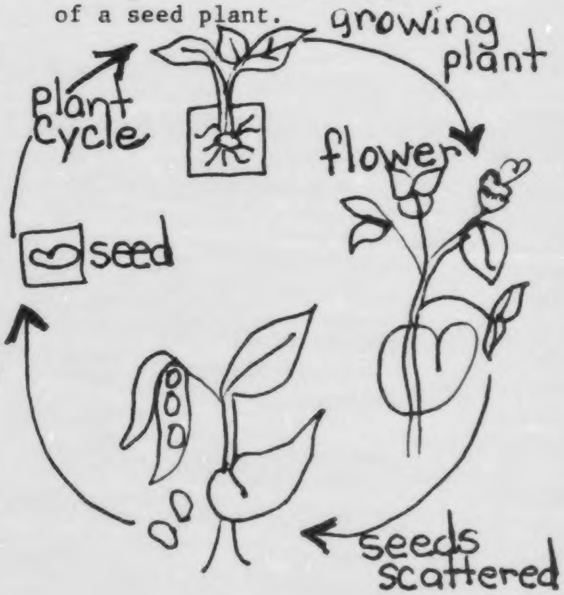
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Use celery stalks, carnations, and asparagus. Place the asparagus, carnation, or celery stalk (the stalk may be split into two parts and each part could be placed into a different color of water) in colored water. Predict what will happen to the asparagus. Observe the asparagus every hour. What happens? Do you see any color in the tip? How did it get there? The trunk of a tree can be compared with an asparagus stem. What do the trunk and branches of a tree do? (During this activity the children will see that the colored water is being drawn up the stem of the plant.)
			C. New plants can be grown from underground stems. Find the eyes on a white potato. Cut the potato into three or four pieces. Each piece should have an eye on it. Plant each piece with the eye up.

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			From what places do the roots and stems grow on the potato and onion? (Roots grow from the base of the sprout that develops from a potato eye. The stem of a potato also grows from an eye. Which started to grow first on the potato, the root or the stem? (The first growth from a potato eye is a stem.)
5. Locate on a drawing the parts of a flower important in reproduction, e.g., petals, pistil, stamen, ovary, pollen.	For reproduction, a plant uses certain parts.	Observing, communicating	A. Observe the parts of a flower by dissecting a flower (lily, gladiola). Make a drawing and label the parts.
6. Match flower parts with their functions.	Flower parts have certain functions.	Observing, inferring, communicating	A. Make a matching chart. List parts on one side and function on the other side. Let students connect part and function with string. (This can be done on electronic board where a bulb would light to indicate correct and wrong answers.)
7. Explain the life cycle of a seed plant.	Relationship between flowers, seeds, and fruit	Inferring, observing, communicating	A. Have children open a soaked bean seed. Have them observe the embryo (baby plant). Have children open a bean pod and observe seeds

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			and their arrangement. Have children infer the relationships between the flower, seeds, pod (ovary). B. Collect parts of flowers in various stages to show which parts of the flower eventually form the seed. C. Bring some fruits to school (apple, peach, tomato, avocado, etc.) and dissect. Locate the seed and the fleshy part. D. Have students draw and label a diagram of the life cycle of a seed plant.


growing plant
Plant Cycle
flower
seed
seeds scattered

AREA: PLANTS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
8. Explain how plants reproduce without seeds.	Some plants can be started from cuttings, runners, bulbs, leaves, or tubers.	Inferring, hypothesizing, observing	A. Have children take various plant parts and grow them (ivy, coleus, etc.).

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AREA: ANIMALS
GRADE: 4-6

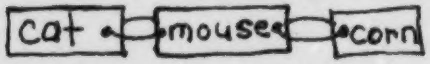
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Describe the five main groups of vertebrates--mammals, birds, reptiles, amphibians, and fishes.	Five groups of vertebrates	Observing, communicating	A. Using pictures of animals that have been divided into the five animal groups, have students list and discuss characteristics of each group. Students should be encouraged to note the similarities and differences among each group.
2. Identify organisms as plant eaters, animal eaters, or both plant and animal eaters.	Some organisms can be classified as plant eaters, animal eaters, or BOTH.	Observing, communicating, inferring, classifying	A. Ask the class members to list several examples of only plant eaters (herbivores), e.g. aphids, ants, worms, hamsters, etc. Chart plant eaters, what they eat, and where they can be observed:

Name	What They Eat	Where Observed

AREA: ANIMALS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Do the same for animal eaters (carnivores) and animals that eat both plants and other animals (omnivores). In what ways are plant eaters alike? How are animal eaters alike?
			B. Given pictures with lots of animals, have children classify each as plant eater, animal eater, or plant and animal eater.
			C. Have children raise ants, crickets, doodlebugs, gerbils, rabbits, etc. Observe their eating habits. What adaptations do they have for eating plants?
3. Classify organism as predator or prey.	Balance of nature	Classifying, observing, inferring, predicting	A. Given a picture of a wildlife scene, have children identify predator-prey relationship.
			B. Set up a terrarium in the classroom with chameleons and crickets, doodlebugs, plants, etc. Predict and observe changes in the terrarium over a period of time.

AREA: ANIMALS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
4. Define a food chain as a series of animals feeding on other animals or plants.	Food chain	Observing, inferring, communicating	A. Write the names of these plants and animals on file cards. wolf leaves owl grass mouse corn fish grasshopper cow people deer cat Make as many foods chains as you can: Punch one hole at each end of the cards. Join each food chain together with yarn.  cat mouse corn B. Make a food web using string designating different children around the classroom to assume the roles of the plants and animals listed below. lion owl hyena antelope rabbit giraffe grass lettuce tree leaves

AREA: ANIMALS
GRADE: 4-6

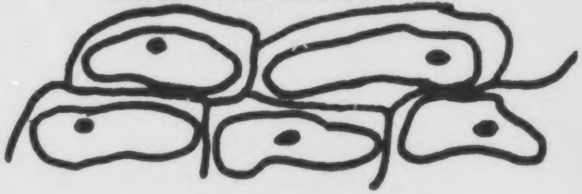
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
5. Identify adaptations that aid in the survival of animals.	Adaptions aid in the survival of animals	Observing, inferring, communicating	A. Have children play a variation of the hawk-mouse game where you place an equal number of toothpicks of different colors in the schoolyard grass. These are the "mice." Have the children (the hawks) try to find as many of the toothpicks as possible within 4 minutes. The number of each color can be counted and graphed. Using a bar graph, have children hypothesize why more of some colors were found than of other colors. *Refer to the appendix on graphing.
6. Describe some of the earliest animals and state how they have changed over a long period of time.	Animals have changed over a long period.	Observing, inferring, hypothesizing	A. Collect pictures or models of prehistoric animals and compare them with similar animals of today. Have them hypothesize reasons for changes in the animals over time.
7. Identify reasons which explain the extinction of animals.	Extinction of animals	Observing, inferring, hypothesizing	A. Gather information from various reference material and draw conclusions about environmental changes versus extinction of prehistoric animals.

AREA: ANIMALS
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
8. Name at least two animals that are in danger of extinction (bald eagle and brown pelican), describing the characteristics that make them vulnerable.	Some animals are in danger of extinction.	Observing, inferring, hypothesizing, communicating	A. Bring newspaper and magazine clippings about endangered species. Make a bulletin board or display about these. Hypothesize and discuss how their extinction may be prevented. Special emphasis should be placed on the brown pelican. B. Contact resource persons from wildlife and fisheries for additional information on the brown pelican.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Define cells as the building blocks of the body.	Cells	Observing, communicating, inferring	A. Observe cells from inside the students' cheeks under the microscope. Obtain cells by gently scraping the inside of the cheek with the blunt end of a toothpick. B. What is an onion skin made of? 1. You will need: onion, microscope, slides, knife, coverslip, medicine dropper, and iodine solution. 2. Cut an onion in half, lengthwise. Remove a thick white scale. Peel the membrane from the inner surface. Cut a small section of the membrane and spread it flat on a slide. Add a drop of water. Then cover it with a coverslip. Make sure you get all the air bubbles out from under the coverslip. Do this by

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			pressing coverslip with eraser end of a pencil. 3. Examine the onion membrane with the microscope. Compare the onion cells you see with those shown below.  Note: Microslide viewers may be substituted for microscopes. They are inexpensive and there are a large variety of slide sets available. What shape do the cells have? Are the cells empty? Locate the cell walls. Draw some onion cells and label the cell walls. 4. Lift the coverslip and add one or two drops of iodine to your slide. Iodine stains the cells. Look at the cells with the microscope and locate the nucleus. Label it on the diagram.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			5. The dark grains between the nucleus and the cell wall make up the cytoplasm. Label it on drawing. C. Have the students place a drop of iodine on the following spots: a. palm of hand b. back of hand c. tip of one finger d. inside of their elbow For the next several days check to see if the spots are still visible. If they are visible, record it. 1. In what order did the spots disappear? 2. Why did the spots disappear? 3. What did you learn about living cells from this activity?
2. Define tissues as cells of the same kind working together to do one job.	Tissue	Observing, communicating	A. Observe and discuss samples of tissue from the butcher shop or use parts from a chicken or turkey.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
3. Define an organ as a group of tissues working together to do a special job.	Organ	Communicating, observing	A. Assign students one organ to research. Have them draw and label the organ. B. Observe and identify organs of a dissected animal.
4. Define a system as a group of organs working together to perform a bodily function or activity.	System	Communicating	A. Have students make a name card for each level of the human body and hang up as a mobile. Place "cells" as the basic building blocks on the bottom. Hang "tissues," "organs," and "systems" each above the other using graduated sized name cards.
5. Identify the functions of the skeletal system as being protection, support, and movement.	Skeletal system	Observing, communicating, inferring	A. Examine several kinds of animal bones (chicken, pork, beef). Lead students to observe characteristics and structure of the bone. B. Obtain X-rays of bones. C. Encourage students to brainstorm as to what organs are protected; list them on the chalkboard.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
6. Distinguish between voluntary and involuntary muscles.	Voluntary and involuntary muscles	Observing, inferring, communicating, classifying	A. Have students feel their own contracted muscles by bending an arm at the elbow or a leg at the knee. Direct students to observe the tightening of the muscle under the upper arm or on the back of the thigh. B. Have one student run in place for a minute and feel the muscles of the heart working rapidly. C. Invite a physical education teacher to demonstrate how muscles can be developed through exercising.
7. Identify the major parts of the digestive system (mouth, esophagus, stomach, small and large intestine).	Major parts of the digestive system	Observing, communicating	A. Using a large chart (or textbook pictures if necessary) have the students trace the digestion of their favorite food through the digestive system. Relate the function of each organ in acting upon the food as it is digested.

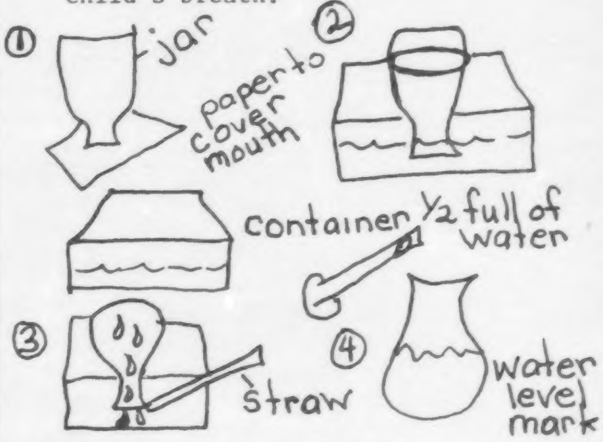
AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
8. Identify the major parts of the circulatory system (heart, blood vessels, blood).	Circulatory system	Observing, inferring	A. Obtain a beef, sheep, or pig heart from a butcher. Have the students note the muscular walls and chambers of the heart. B. Obtain a heart puzzle by writing to the American Heart Association 7320 Greenville Avenue Dallas, Texas 75231 C. Sit quietly, place index finger and middle fingers on one hand of the wrist of your other hand. When you feel the movement, you are feeling your pulse. Have a partner time it for 30 sec. During that time count the number of times you feel your pulse. Switch places with partner and repeat. What happens when you run in place? D. Make arrangements to have a medical technologist visit the classroom to explain the procedure used in obtaining blood and the importance of this procedure.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
9. Identify the major parts of the respiratory system (nose, trachea, wind pipe, lungs).	Respiratory system	Observing, inferring, communicating, measuring	A. The graduated cylinder and water can be used to measure the volume of air a person can breathe out in one breath. Fill a bottle with water and place a piece of paper over the mouth of the bottle. Invert the bottle into a container that is half full of water. When the mouth of the bottle is below the surface of the water, slide the piece of paper away. Try not to let any air in the bottle. Divide the children into groups of five and have each child in turn blow through a straw, holding the end of the straw under the mouth of a bottle so that the child's breath is collected in the bottle. With a wax pencil or crayon, mark the level of water in the bottle from the container; and with a graduated cylinder, measure how much water it takes to fill the bottle to the mark.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			This is the volume of the child's breath.  ① jar paper to cover mouth ② container 1/2 full of water ③ straw ④ water level mark *See appendix on measuring volume. B. Using a low-power microscope and a goldfish, children can watch blood circulating in the capillaries of the fish's tail. Wrap the fish in wet cotton and lay it in a shallow saucer of water. Place the saucer on the stage of the microscope and focus on the thinnest part of the tail, which is

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			outside the cotton. Children should be able to see many criss-crossed tiny tubes--the capillaries. Some of the red blood cells will move in one direction, some in another. (Be careful not to keep the fish out of the water too long.) C. Relate the lungs to a sponge. Place a sponge in water and compare the absorption of water by the sponge to the absorption of air by the lungs. Have students note the increase in the sponge's size. Squeeze the water out, relating it to breathing out and decrease in lung size. D. Invite a doctor or medical worker from the lung association in your area to talk to your class about the diseases of the lungs and the importance of clean air to the respiratory system.

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
10. Identify the organs of excretion (lungs, kidneys, skin, large intestine).	Excretory system	Observing, inferring	A. Teacher information: Limewater is prepared by adding two tablespoons of calcium hydroxide ($Ca(OH)_2$) to a quart of warm water. Shake thoroughly and leave overnight. Decant the clear liquid into another jar. Keep the containers sealed, as carbon dioxide in the air combines with the clear limewater to slowly turn it cloudy. Limewater tablets or solutions can be purchased in many drugstores. The change in limewater from clear to cloudy is a specific test for carbon dioxide. BTB (can be purchased in pet stores) can also be substituted for limewater. Its blue color in the presence of CO_2 turns yellow. Have two containers. In one place water, in the other, limewater. Have students blow into both containers (using a straw). The container of limewater will

AREA: HUMAN BODY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			become cloudy to indicate the presence of carbon dioxide.
11. Identify the major parts of the nervous system (brain, spinal cord, and nerves).	Nervous system	Observing, inferring, communicating	A. Demonstrate nerve impulses. Have the children form a large circle in the room and join hands. One student begins the activity by squeezing the hand of the student next to him who in turn squeezes the hand of the next student. This continues around the circle until it returns to the first student. Variation: Have students time how long it takes for the message to complete the circle. B. Bring in a fish or chicken and allow students to dissect the backbone to locate the spinal cord and some nerves entering it.

CURRICULUM STANDARDS

EARTH SCIENCE

4-6

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Define minerals.	Minerals are the materials that rocks are made of.	Observing	A. Have your students use a strong magnifying glass to examine sand. They will notice that the minerals contained in sand differ in color, size, and shape. Black crystals - mica or biotite If they are attracted to a magnet, they are probably magnetite. Rectangular black crystals will probably be hornblende. Colorless glassy crystals - quartz Red crystals - garnet
2. Classify rocks into groups according to various properties (size, shape, color texture, etc.).	Rocks have different properties.	Observing, classifying, communicating	A. The children may enjoy an outdoor rock scavenger hunt. Give each pair of children a bag to collect their rocks. Scavenger List: 1. A rock smaller than a finger-nail on your pinky 2. A rock bigger than your fist

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			3. A rock with something growing on it 4 A square rock 5. A round smooth rock 6. A rock with more than one color 7. A rock that makes you feel good 8. A very rough rock 9. A rock that would make a good paperweight 10. A rock that would make a good gift B. Have students form groups and use the rock samples. Have children classify the rocks according to various characteristics, e.g., size, color, shape, texture, hardness. Have children make a chart to describe their rocks. Rock ________ Size ________ Shape ________ Color ________ Texture ________ Luster ________

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Have the children write a five line poem about a concept, a place, a thing, or a person, using both observations and feelings. Example: 1. Sand--(a single word) 2. Smooth bits of earth - (an observation of line one) 3. Warmth--(a feeling about line one) 4. Shining in the sunlight - (observation of line one) 5. Grains--(A one word meaning for line one) Some suggested words are rock, sand, geologist, properties, particle, sound, and earth.
3. Identify the three groups of rocks.	Sedimentary, igneous, and metamorphic rocks	Observing, classifying	A. Have students examine rocks which have already been identified. Look for similarities within each group and differences among the three groups.

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
4. Describe how the earth's surface has been changed by weathering and erosion.	Weathering and erosion	Observing, inferring, experimenting	A. 1. Place five spoonfuls of plaster of Paris in a paper cup. Add water to wet the mixture. Stir. 2. Dip a pencil in liquid soap. Stick it in the center of the plaster of Paris. 3. Leave the pencil in the plaster of Paris until the plaster is dry. 4. Take the pencil out. Tear off the paper cup. 5. Fill the pencil hole with water. 6. Put the plaster with water in an ice tray. Place in a freezer. 7. On the next day, take out the plaster from the freezer. Observe. What did you learn? 1. How was the water changed? 2. What has happened to the plaster? B. Take a pan and make a sand or dirt hill. Using a pitcher of water, pour it gradually over the top of the hill and observe the results.

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Take a walk around the school. Observe signs of weathering and erosion.
5. Identify how mountains are formed.	Mountains are formed in different ways.	Observing, inferring, communicating	A. Flatten three or four different colors of modeling clay. Pile the different colors on top of each other to make layers. Push the layers from each end. What happens? Now push the layers until they crack. How do the layers look? Have you seen layers of rock that look like folded layers of clay? Where have you seen them? B. Use "National Geographic" pictures to show examples of old, worn mountains and newer mountains with rough, unweathered (comparatively) edges.
6. Explain the formation of a volcano.	Formation of a volcano	Observing, inferring, communicating	A. Make a pinhole in a full tube of toothpaste. Squeeze the tube hard. What happens?

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Stop squeezing the tube. What happens? Why does toothpaste come out of the pinhole when you squeeze the tube? Why does lava come out of the earth, thus forming a volcano? B. Use "National Geographic" pictures and stories on volcanoes, both past and present. C. Have children draw and label the parts of a volcano. D. Have children make a diorama to show the stages of a volcano as it grows after each eruption.
7. Identify the causes and characteristics of earthquakes.	Characteristics of earthquakes	Observing inferring, communicating	A. Clinch your fists and put them together. Press the knuckles of each hand tightly together and push hard sideways in different directions at the same time. What happens?

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			If layers of rock in the earth are pressed together this way, what might happen?
			If you were standing near layers of rock when they moved, how would you feel?
			B. Lay two books on the table leaving a narrow path between them; lay four or five marbles in the path. Roll another marble against the line of marbles. Roll another marble against the row of fixed marbles. Compare this to earthquake waves traveling through a solid.
			Would earthquake waves travel through dense liquids like the mantle and core? If so, would there be any change in the waves?
			C. Have students demonstrate shock waves using a Slinky. One pupil will hold one end of the spring and another one will stretch it out to about two meters. Give the spring an up-and-down snap. What happens?

AREA: EARTH
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			D. Have some pupils do research on the Alaskan earthquake of 1967, the San Francisco earthquake of 1906, and the Los Angeles earthquake of 1971. Compare the intensity of each with the others. Which caused the greatest loss of life? Why do you think this is true?
8. State how fossils are formed.	Fossilization	Observing, inferring, communicating	A. Cut the top off a milk carton. Cover both sides of a leaf with vaseline. Put it in the bottom of the milk carton. Pour plaster into the carton. When the plaster is hard, tear off the carton. Take the leaf out of the plaster. What can you see in the plaster? Look for other kinds of fossils in rocks. Note: You can use paper medicine cups so that each child can make his own fossil. B. Many fossils are formed from plants and animals that have decayed. However, scientists have found some

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			fossils of living things which have not decayed. Where do they find these fossils? Why haven't these fossils changed very much? C. A mastodon tooth that was found weighed three pounds. Suppose this mastodon weighed 4,000 times the weight of this tooth. How much did the animal weigh? D. Trace a drawing of a tyrannosaurus skeleton. Make a ditto of it in puzzle form. Have the children cut out the bones and use them to form an animal. The parts should be glued down to large pieces of construction paper. Have children trace around the outside of the skeleton to show the probable appearance of this animal. Have children compare their pictures and figure out what dinosaur it was.

AREA: WEATHER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. Describe the composition of air.	Air is a mixture of gases.	Inferring, observing, interpreting data, hypothesizing	A. The make-up of the earth's atmosphere is a mixture of gases, water vapor, and dust particles. Research the atmosphere in textbooks, encyclopedias, and other materials. Identify the gases that make up 99% of the air at sea level. Which gas takes up 78% of any given volume of air? Why is this gas important? Which gas accounts for 21% of any given volume of air? In what way is this gas important to life on earth? List other gases that make up the remaining 1% of the earth's atmosphere. One of these gases is very essential to life on earth, yet it is only .03% of its atmosphere. What gas is this and why is it so important to life as we know it? Ask children how life would be different if the same gases were present in different percentages.

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GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
2. State that air contains water in the form of an invisible gas called water vapor.	Air contains water vapor.	Observing, hypothesizing, inferring	A. Fill a glass with colored water and ice cubes. (Use food coloring or ink to color the water.) Wait a few minutes. What has happened to the outside of the glass? Where did the drops of water come from? What proof do you have that they did not come from inside the glass container?
3. Tell the name of the process by which water changes to a gas.	Evaporation	Observing, inferring	A. Rub a wet sponge over the surface of the chalkboard and watch the film evaporate. Where does this water go? Repeat with rubbing alcohol. Can the children smell it after it evaporates? What does this imply?
4. Tell the name of the process by which water changes from a gas to a liquid.	Condensation	Observing, inferring, controlling variables	A. Place ice in a glass of water and stir. Beside this place another glass of water with no ice. Water droplets will form on the outside of the glass which has ice in it. No droplets will form around the glass with no ice. There is nearly always water in the air which condenses upon cooling.

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GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
5. State that a cloud is made up of tiny drops of water.	Clouds are made of water vapor.	Observing, inferring	A. Rinse a milk bottle or any jar with similar sized opening thoroughly in hot water. Put hot water in the bottle so that it is two or three inches deep. Place an ice cube on top of the bottle. Watch the cloud form. 1. How did the ice cube affect the water? 2. How are clouds formed?
6. State that fog is a cloud near the ground.	Relationship between fog and clouds	Observing, inferring	A. Use 4A and ask the following questions: 1. What is fog called when it is in the sky? 2. How does fog form?
7. Identify cirrus, stratus, and cumulus clouds.	There are different types of clouds.	Observing, classifying, communicating	A. Have the children make a drawing of the types of clouds. Have the children describe how the clouds look. Discuss the three main types of clouds.

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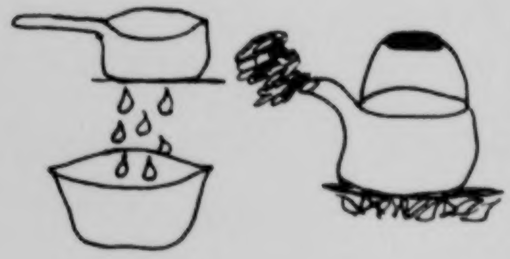
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Cirrus clouds are white, feathery clouds. Cumulus clouds are white fluffy clouds. Stratus clouds form layers across the sky. B. Have students classify their cloud pictures into the three categories. C. Use cotton and blue construction paper to make the three types of clouds.
8. Identify the continuous movement of water from the earth's surface to the atmosphere and back to the surface of the earth as the water cycle.	Water cycle	Observing, inferring	A. Bring water in a tea kettle to boiling so steam is rising from the spout. Put ice cubes into pan of water to cool water. When steam is rising from kettle, hold the pan of ice water over the spout so steam from spout will strike the bottom and the sides of the pan. 

AREA: WEATHER
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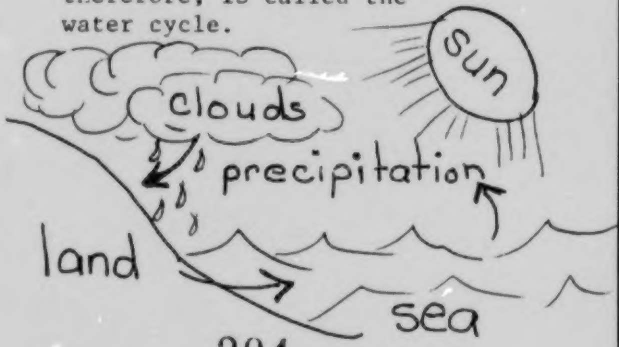
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			The steam from the kettle, upon striking the cold pan, is cooled and condenses to form droplets of water on the outside of the pan. These droplets collect and fall from the pan like falling rain from the cloud. Water, when heated, rises in the form of vapor into the air. Upon striking cool air, the vapor condenses into tiny droplets of water or moisture. These droplets collect upon particles of dirt in the air to form clouds. When condensed further, this moisture falls from the clouds in the form of rain. B. Teacher should encourage children to infer that this process forms a cycle and, therefore, is called the water cycle.



AREA: WEATHER
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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Have students illustrate and explain the water cycle.
9. Identify the various forms of precipitation (rain, sleet, snow, hail).	Precipitation occurs in several forms.	Observing, inferring, communicating	A. Review water cycle activity 8B. B. Identify the various forms of precipitation: rain, drizzle, sleet, snow, hail. Teacher information: These are all forms of precipitation because they all fall from the atmosphere. Note: Dew, frost, fog, and clouds are forms of condensation, not precipitation.
10. Define weather.	Weather is the condition of the atmosphere over a short period of time.	Observing, inferring, operationally defining, communicating	A. Have children watch a TV weather report. Discuss in class: 1. What does a weatherman talk about? 2. What things make up a weather report? 3. Is weather the same in all places at the same time? 4. Is the weather always the same in the same place?

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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			5. What causes changes in weather? B 1. Urge children to observe weather conditions for several days at school and on the way to and from school 2. Have children find words that describe the weather: cloudy, warm, cold, wintry, sunny. C. Make a weather clock by cutting a large circular disc from a stiff cardboard. Divide the clock face into sections and let children select words from their list to place in the various sections. Fashion two clock hands and attach them with brass fasteners. Urge children to suggest how the weather clock might be used. 1. If we set our clock in the morning when we come to school, will it be correct all day? 2. Why do we need two clock hands?

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CRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			D. Have children find pictures of different kinds of weather and describe the weather shown. 1. What can you tell about the weather by looking at the picture? 2. Is the wind blowing? 3. Can you tell if it is hot or cold? 4. What else can you infer from the picture? E. Have students collect the weather reports from the newspaper for a period of two weeks. Students should make charts similar to the following to use in recording the information they have gathered from these reports. Make six columns on a sheet of paper. In the first column put the date. In the other column put the following: high temperature, low temperature, humidity, rainfall, condition of sky.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Sunny ☼ Partly cloudy ○ Mostly cloudy ◐ Overcast ● Use the chart to help observe changes in weather conditions over a period of time. Date _____ High Temp. _____ Low Temp. _____ Hum. _____ Rainfall _____ Cond. of Sky _____ (Weather Record for one week)
11. Tell the name of the instrument that measures changes in air pressure.	A barometer measures changes in air pressure.	Measuring, observing, inferring, communicating	A. Can you make a barometer? TIN CAN BAROMETER The tin can barometer can be used to measure changes in air pressure. Materials: One tin can, a broom straw or soda straw, a

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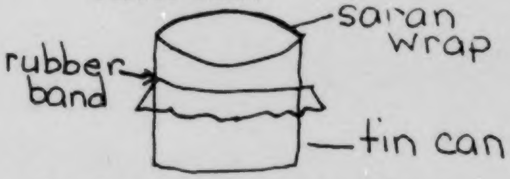
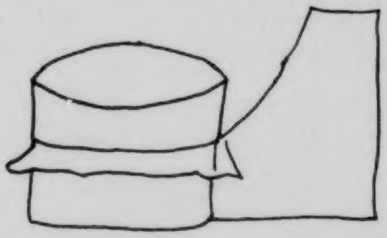
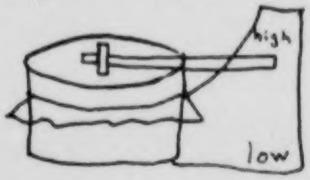
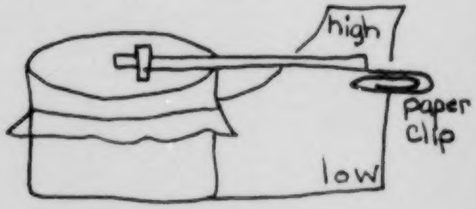
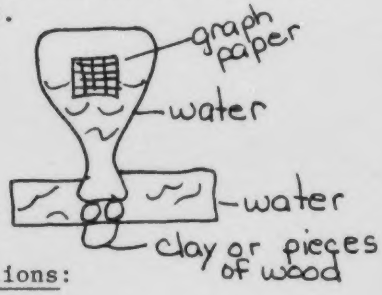
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			rubber band, a piece of saran wrap (large enough to cover the top of the can), a piece of scrap paper, and a paper clip. Construction: 1. Place saran wrap over the top of the tin can and hold tight with the rubber band.  2. Wrap the paper around the can so part of it is higher than the top of the can, and staple in place. 

AREA: WEATHER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			3. Attach straw to the middle of the saran wrap with glue or tape.  4. Mark the position of the straw on the paper with a paper clip and watch to see if the straw moves up or down.  Have a child record from television or newspaper the exact barometric pressure each day for one week.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			How do the barometer readings compare with those recorded from the television and newspaper over a period of several weeks? How can you explain any differences observed? After listening to weather reports on radio and TV, you have learned that an area of high pressure often means what kind of weather? Low pressure? How well did your barometer forecast the weather? B. Barometer Materials for 4-5 pupil team: Clear glass soda pop bottles Colored water Pan or bowl Paper Two drops of oil Procedure: Fill the bottle about three-fourths full of colored water. Cover the opening tightly and turn the bottle upside down with its neck under the water in a pan.

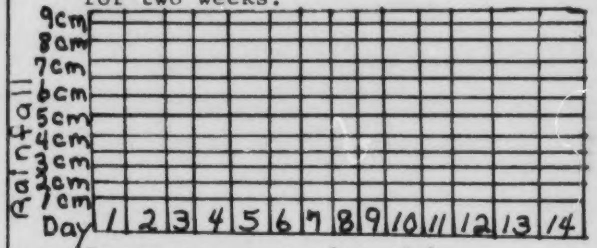
AREA: WEATHER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Remove the covering and support the bottle over the water.  Questions: 1. How do you think the level of water in the bottle will change day by day? 2. What reason do you have for your prediction? C. Discuss the fact that the barometric pressure or the oncoming weather changes can sometimes be sensed by individuals. Can an aching knee or shoulder really mean a storm is coming? What other ways have you heard that changes in air pressure affect the weather?

AREA: WEATHER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
12. Tell the name of the instrument used to measure rainfall.	Rain gauge	Observing, inferring, measuring, predicting, interpreting data	A. Obtain a large kitchen funnel and a glass jar whose mouth has exactly the same diameter as the rim of the funnel. Pour exactly 1 centimeter of water into the jar, using a ruler to get the exact depth. Pour this water into a narrow bottle such as an olive jar. Place a strip of paper about 12 millimeters wide against the side of the narrow bottle, using strips of cellophane tape to hold the paper in place. Make a mark on the strip of paper to indicate the centimeter of water and label this mark "1 centimeter of water." Measure the distance from this mark to the bottom of the water in the jar; use this distance to make additional marks on the paper, each mark accounting for another centimeter of water. Now divide the space between each mark into 10 smaller marks so that each mark represents 1/10 cm of water. Empty the narrow bottle.

AREA: WEATHER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Put the narrow bottle in a large can so that the wind will not blow the bottle over during a rainstorm. Put the funnel in the neck of the narrow bottle and place the can in an open area. The funnel will collect the rain and send it into the narrow bottle, where the amount of rainfall can be measured. Measure and record the rainfall using your rain gauge for a period of two weeks. Prepare a graph to show the daily rainfall in your area for two weeks.  Compare your results with the results of the weather service reports in your area. (NOTE: Rainfall may

AREA: WEATHER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			be measured and reported in various locations near where you live by the weather service or TV and radio stations.)
13. Identify humidity as the amount of water vapor in the air.	Humidity	Observing, inferring, measuring, communicating	A. Have children slowly add small pieces of ice to a tin can or glass half filled with water, stirring regularly with a thermometer. Measure the temperature at which a thin film of water appears on the sides of the can. Be careful not to breathe on the sides of the can when watching for dew to form. The water vapor in your breath might condense on the sides of the can and provide inaccurate results.

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AREA: SOLAR SYSTEM
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Define the solar system.	The solar system is made up of the sun and the objects that move around the sun.	Observing, communicating, operationally defining	A. Give students certain "solar system" titles. Let some act out stars, moons, planets, etc. Have them act out and label the solar system. This could be a playground activity. B. Have students build models of the solar system using a variety of items. Materials needed: Grapefruit, apple, marbles, basketball, beans, peas, grass seed. The sun will be represented by a ball that is a little larger than a basketball set up in a model:

AREA: SOLAR SYSTEM
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Mercury - a grass seed, 25 m from the ball Venus and Earth - a bean 50 m and 70 m from the ball Mars - a small pea, 100 m from the ball Jupiter - a grapefruit 321 m from the ball Saturn - an apple, 643 m from the ball Uranus - a marble, 1,287 m from the ball Neptune - a little larger than Uranus, 1,931 m from the ball Pluto - a small pea, 2,574 m from the ball This model shows why it is difficult to build a scale model.
2. Distinguish between rotation and revolution.	Rotation and revolution	Observing, predicting	A. Have two students assume the roles of the sun and the

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			earth. As the sun remains stationary the earth would walk around the sun, spinning as he/she goes.
3. Define eclipse as the blocking of light from the sun by the moon or earth.	Eclipse	Observing, inferring, communicating	A. Activity: 1. Have a lamp to represent the sun, a ball to represent the moon and a globe to represent the earth. 2. Hold the ball between the lamp and the globe so that a shadow of the ball is cast on the globe. 3. Students are able to observe the shadow on the globe and identify the occurrence as a solar eclipse. 4. To show a lunar eclipse, hold the ball about 60 cm (2 ft.) from that side of the globe which is not facing the lamp. 5. Students observe the ball in the shadow and identify the occurrence as a lunar eclipse.

AREA: SOLAR SYSTEM
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
4. Identify the solar system as a part of a larger group of stars called the Milky Way Galaxy.	Our solar system is in the Milky Way Galaxy.	Observing	A. Locate the Milky Way on a clear moonless night as far away from the lights of a city as possible. Binoculars or a small telescope will help. B. Look for a picture of the Galaxy. Show the position of the sun and the solar system in the Galaxy. Point out the three spiral arms and discuss the differences in the speed of the stars in the Galaxy.
5. Identify a constellation as a group of stars.	A constellation is a group of stars.	Observing, inferring, hypothesizing	A. Observe how the constellations seem to change their positons. Observe the position of constellations, such as the Big and Little Dippers or Orion, early in the evening and then later in the evening. Their positions will have changed. This apparent change is caused by the earth's rotation. Observe their position one night each week for four weeks at the same time each night. Again, their positions will have changed. This apparent change is caused by the earth's revolution around the sun.

CURRICULUM STANDARDS

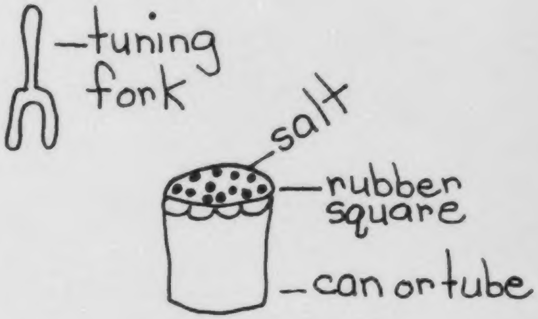
PHYSICAL SCIENCE

4-6

AREA: SOUND
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Explain that sound is produced by vibrating matter.	Sound is produced by vibrating matter.	Observing, inferring	A. Pluck a stretched rubber band and listen to its sound. Observe the rapid back and forth motions--its vibrations. B. Put your fingers on your throat and say "ah." something inside is vibrating--something very much like the rubber bands. These are your vocal chords. C. Place a thin, plastic, 12-inch ruler across the edge of a table so that approximately half of it protrudes. Hold it down firmly with one hand. Hear, feel, and see the vibrations.
2. State that sound travels through solids, liquids, and gases.	Sound vibrations travel through solids, liquids, and gases.	Observing, experimenting, inferring	A. How does sound travel? Materials for 2-3 pupil teams: Large balloon, scissors, small can or cardboard tube from bathroom tissue, tuning fork, rubber band or string, salt or fine sand.

AREA: SOUND
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Procedures: Using your scissors, cut a square from a rubber balloon that is larger than the diameter of the can or tube you have. Stretch the rubber square over the open end of the can or tube and fasten with a string or rubber band. Sprinkle some salt or fine sand on the rubber square. Strike a tuning fork and hold it about an inch over the top of the square as in the figure shown.  tuning fork salt rubber square can or tube Ask the following questions:

AREA: SOUND
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			1. What did you observe? 2. How close must the tuning fork be to cause the change in the salt? 3. What does this show about sound? 4. From your observations, how does sound travel? 5. Does sound travel through air? 6. How?
3. Compare and contrast how sounds travel through different media.	Sound can travel through some media better than others.	Observing, classifying, inferring, communicating	A. With a pencil, tap lightly on different objects to determine which carry sound well. Complete the following chart:

Objects	Good	Fair	Poor
1. Desk			
2. Window			
3. Book			
4. Hand			
5. Clothes			
6			
7.			
8.			
9.			
10.			

AREA: SOUND
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Have students construct telephones using paper cups and strings. Repeat using different materials such as plastic cups and wire. Compare and contrast each.
4. Tell the word that means the highness and lowness of sound.	Pitch is the highness or lowness of sound.	Observing, inferring, classifying, communicating	A. Have a boy and a girl speak at the same time and have other members listen for differences in pitch between voices.
			B. Have children blow through different lengths of drinking straws. Have them observe the different levels of sound produced when children blow through the straws.
5. Identify sounds (noise) that create problems in our environment.	Problems of noise pollution	Observing, inferring, classifying	A. Have students listen for sounds in their environment that they classify as noise. Make a list. 1. What were the sources of noise? 2. What problem(s) did each noise create? 3. How can we help reduce noise pollution?

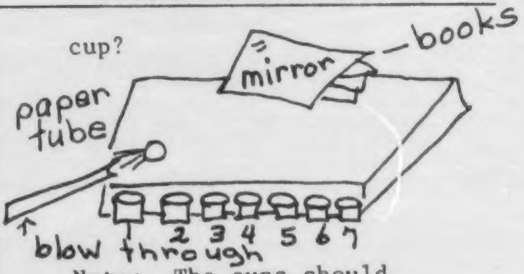
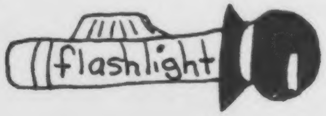
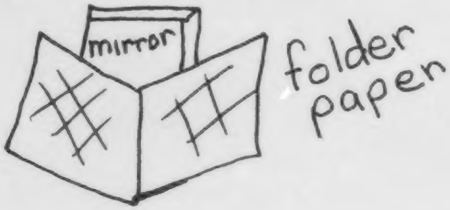
AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	**CONCEPT**	**PROCESS SKILLS**	**SUGGESTED ACTIVITY**
The student will be able to:			
1. State that light travels in straight lines.	Light travels in straight lines.	Observing, inferring, communicating	A. Make a long tube from paper. You will be able to look through it as long as the tube is straight. Light can travel through the tube to your eye. Bend the tube and you will no longer be able to see through it. Why? B. To reinforce the idea that light travels in straight lines, try the following: 1. Use a paper punch to punch holes through the center of three 3x5 filing cards. The holes must be in the exact same spot on each card. 2. Stand the cards in clay 10 cm apart, one behind the other. The holes should be in a straight line. 3. Stretch a piece of string through all three holes. Is the string straight? Can you see through all three holes at the same time?

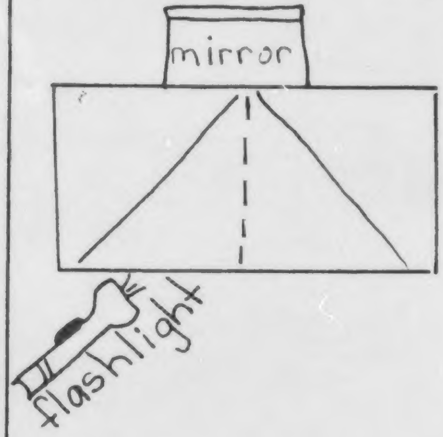
AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			4. Move the center card so that the holes are offset at least 2 cm. 5. Carefully stretch the string through all three holes. Is the string straight? Can you see through all three holes? Why not? The holes are not in a straight line, and light travels in a straight line.
2. Tell the name of the word that means the bouncing back of light.	Reflection	Observing, predicting, inferring, communicating, formulating hypotheses	A. Students blow a table tennis ball against a mirror to make it go into a cup that is not in the direct field of vision. This activity should show that the ball will bounce off of the mirror at the same angle it strikes. Ask the student to predict which cup their ball will enter. Where should he aim to hit each cup? How must he aim the ball to hit the

AREA: LIGHT
GRADE: 4-6

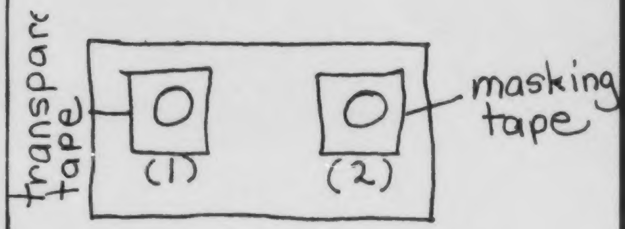
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			 cup? mirror books paper tube blow through 1 2 3 4 5 6 7 Note: The cups should be evenly spaced and the mirror placed midway between the two end cups. B. Cover the end of a flashlight with black paper. Then cut a narrow slit in the paper. It should go from the center to the outer edge.  flashlight Fold a piece of paper in half. Open it and place it in front of a mirror.  mirror folder papen

AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Shine a beam of light across the paper to where the fold meets the mirror. Ask the students to predict before they shine the light on the mirror where the paths of light will look alike.  The students should be able to infer that when light strikes a reflecting surface, the angle at which it is reflected equals the angle at which it is struck.

AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
3. Classify objects as opaque, translucent, or transparent.	Objects can be classified as transparent, opaque, or translucent.	Observing, classifying, inferring, defining operationally	A. Introduce the words transparent, translucent, and opaque. Find out if the children know what they mean. Materials needed: 1 square of cardboard, 1 piece of transparent tape, 1 piece of masking tape. Procedure: 1. Have the children hold up the cardboard to the light. Ask: It is transparent, translucent, or opaque? (opaque) 2. Punch two holes in the cardboard with your pencil. 3. Label the holes (1) and (2). Cover hole (1) with transparent tape, and cover hole (2) with masking tape.



AREA: LIGHT
GRADE: 4-6

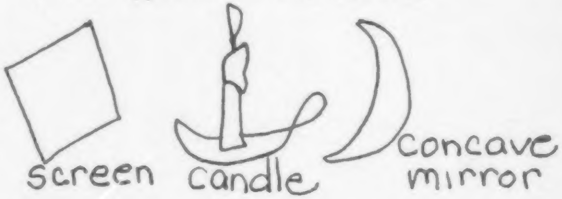
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Is tape (1) transparent, translucent, or opaque? What about tape (2)? Can you make tape (1) translucent? Can you make tape (2) opaque? If so, how? B. Make a chart with three columns. Label your columns with the words "translucent," transparent," and "opaque." Down the side of your chart, write the names of these materials: Clear plastic wrap, black construction paper, white construction paper, block of wood, piece of waxed paper, piece of window glass. Hold each piece of the material in front of a flashlight. Observe and record what you see after

<table>
<tr><th>COMPETENCY/PERFORMANCE OBJECTIVE</th><th>CONCEPT</th><th>PROCESS SKILLS</th><th>SUGGESTED ACTIVITY</th></tr>
<tr><td></td><td></td><td></td><td>each of the materials is tested.
<table>
<tr><th>Material</th><th>Trans- parent</th><th>Trans- lucent</th><th>Opaque</th></tr>
<tr><td>Plastic Wrap</td><td></td><td></td><td></td></tr>
<tr><td>Black Paper</td><td></td><td></td><td></td></tr>
<tr><td>White Paper</td><td></td><td></td><td></td></tr>
<tr><td>Block of Wood</td><td></td><td></td><td></td></tr>
<tr><td>Waxed Paper</td><td></td><td></td><td></td></tr>
<tr><td>Window Glass</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>4. Tell the name of the word that means the bending of light rays as they pass from one medium to another.</td><td>Refraction</td><td>Observing, predicting, inferring, communicating</td><td>A. Use a glass container and a pencil. Predict what happens to the pencil as you change your position of viewing the pencil.

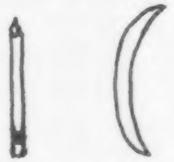
Stand the pencil in the water with the eraser above the waterline. Then observe the pencil at different angles and positions. Have the students bend down so</td></tr>
</table>

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			their eyes are at water level, and look. Look at the pencil from above. Infer why the pencil seems to change shape as you change your position. B. Hold a page in a book behind a glass. Look at the print when the book is held close to the glass. How does it look? Now hold the book several inches from the glass. How does it look now? Look at the same page with a magnifying glass close to the page. Then move the magnifying glass farther away and observe. When you held the book print close to the glass, what seemed to happen? What happened to the print when you moved the book farther away? (Letters are smaller and reversed.) When you looked at the print through

AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			the magnifying glass, did it look the same as through the glass? (It should have been the same.)
5. Distinguish between concave and convex mirrors.	Differences between concave and convex mirrors	Observing, predicting, inferring, classifying	A. Predict how images are projected by a concave mirror. Use a long strip of reflective metal, such as an icing spatula. Materials: Reflective metal that can be bent to form a concave surface or a convex surface Place a candle between a paper screen and a concave mirror. Diagram the image as it appears on the screen.  Note: The image is inverted.

AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Predict how an image will be reflected by a convex mirror. Place a pencil in front of a convex mirror. Diagram how the image is distorted.  Note: The reflected image of the pencil appears to bend outward.
6. Distinguish between concave and convex lenses.	Differences in concave and convex	Observing, inferring, classifying, predicting	A. Simple convex and concave lenses can be made with wires and water. Use a piece of thin wire about eight cm long. Wrap one end of it once around a pencil point. Make as perfect a circle as possible. About five mm across is a good size.

AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Put a drop of water on the loop. Predict what will happen to printed words as the lens is held over them. Note: They will be using convex water drops. The words would be magnified because the drop is thicker in the center than at the edge. Again get a thin film of water on the wire loop. Wipe your finger across the drop to remove part of the water. When enough water is removed the drop [illegible] become thinner at the center than at the edge. Predict what will happen to printed words as the lens is held over them. Note: They will be using concave lens. The words will be reduced because the lens is thinner in the center. Convex Concave

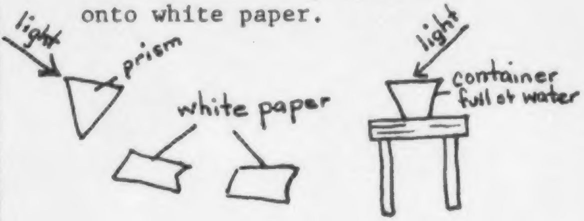
AREA: LIGHT
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Concave: Curved or rounded inward. Convex: Curved or rounded outward. Have the students observe the shape of convex drops and concave drops carefully. Then infer why the convex lens magnifies and the concave lens reduces.

AREA: COLOR
GRADE: 4-6

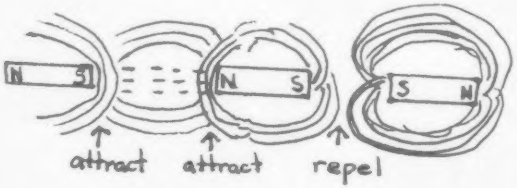
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. State that white light is a mixture of all colors.	White light is composed of different colors.	Observing, inferring, communicating	A. Use a prism to make the spectrum on the wall or ceiling. Have the children look at the colors and explain that white light is made up of all the colors in the spectrum plus some light rays which we do not see. The prism breaks the light up into the colors of the rainbow.
2. List the colors of white light in sequence--red, orange, yellow, green, blue, indigo, violet.	The colors of white light	Observing, inferring, communicating	A. Refer to activity 1A.
3. Compare the colors of the spectrum of white light with those of the rainbow.	Colors of the spectrum are the same as rainbow colors.	Observing, inferring, predicting, formulating hypotheses	A. Place a picture of a rainbow on the wall. Have children compare the colors (and order of colors produced by a prism). B. Ask the students to predict what will happen to sunlight as it passes through (refracted) a prism or glass

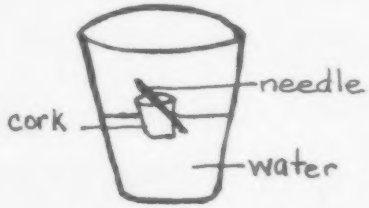
AREA: COLOR
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			of water and is projected onto white paper.  light prism white paper light container full of water Note: The students should use direct sunlight if possible, and the white paper should be placed in a shaded area. A flashlight or projector will work as the source of light. Ask the students to use their observation to formulate a hypothesis about how rainbows are formed.

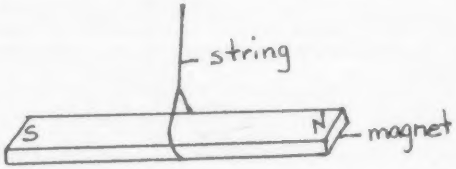
AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. State that certain parts (like poles) of a magnet repel each other while certain parts (unlike poles) attract each other.	Like poles repel; unlike poles attract.	Observing, inferring, communicating	A. Have students place two magnets about a foot apart on a table. Slowly move one magnet toward the other. What happened? B. Tie a string around the middle of a bar magnet. Let the magnet hang in the air by holding the string. Hold the second bar magnet in your other hand and bring it close to the first magnet. What happens? Turn the magnet around and test each side of the magnets. ASK: Did the magnet on the string react in the same way as you tested each side? Why not? How can you explain results? C. Pour iron filings on paper that is covering two bar magnets. (The paper and magnets may be placed on an overhead projector.) Have the students draw the pattern that is observed.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			The students should make inferences to explain the repulsion and attraction of the filings.  D. Identify the North and South Poles of a magnet using the known poles of another magnet. E. Give students a group of magnets. Be sure that only one of the magnets has the poles marked. Ask children to test each magnet against the one that is marked to identify the poles of the unmarked magnets. NOTE: Review Objective 1 before you begin this activity.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
2. Define North and South Poles.	North magnetic pole points toward north geographic pole; South magnetic pole points toward south geographic pole.	Observing, inferring, communicating, operationally defining	A. Can you make a compass? Materials for 2-3 pupil team. Container made of glass or china; sewing needle, bar magnet, cork top, or 1/4 inch slice of cork disk from a pop bottle cap; water, teaspoon of detergent, knife, compass, string. Procedure: Fill the container about 1/2 full of water and gently stir in about a teaspoon of detergent. Using a knife, cut a shallow groove across the top of a cork (to keep the sewing needle from rolling off). Hold the needle and stroke it 40-50 times from its blunt end to its point with one end of the magnet. Put the needle in the groove of the cork and place the cork in the water, as in figure below. 

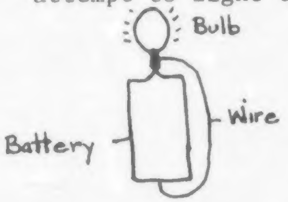
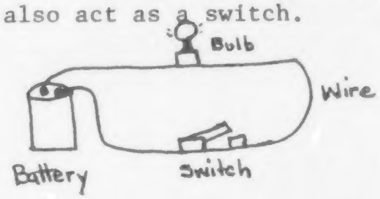
AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			In what direction will the needle point? What did you observe? Repeat the activity; this time stroke another needle as before but with the other end of the magnet. Is the blunt end of the needle pointing in the same direction as before? How can you explain any change of direction? Observe the needle of a compass. In what direction is it pointing? What do you think the needle of the compass is made of? B. If a bar magnet is hung so it can swing freely, in what direction will the ends point? (See figure below.) 

AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Tie a string around the middle of a bar magnet. Suspend the magnet in the air. It should now be a freely moving magnet. It will spin and turn for a few minutes. When the magnet stopped moving and turning, what direction did it point? Use your compass to help you determine the direction the magnet is pointing. Did the north end point toward the north of the earth? Did the south end point toward the south of the earth? Have children describe the North and South poles of a magnet in their own terms (e.g., north magnetic pole is the pole that points to the north geographic pole of the earth).
3. Explain that by rubbing two different kinds of materials together, static electricity can sometimes be produced.	Static electricity	Observing, inferring	A. Rub a hard rubber comb briskly with wool cloth. The comb will pick up small bits of paper.

AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			B. Rub a blown-up balloon with a wool cloth, and put the balloon against the wall. It will stick to the wall. Electrons are rubbed off the wool onto the objects, charging the objects negatively and the wool positively.
4. Diagram a complete circuit consisting of a dry cell, a bulb, and one wire.	Circuit	Observing, communicating	A. Let each student use a bulb, a dry cell, and one wire to attempt to light the bulb. 
5. Identify when a circuit is open and when it is closed.	Open and closed circuits	Observing	A. Let groups of students wire a simple circuit with a bulb, battery, switch, and wire. Note that a closed knife switch "closes" (completes) the circuit, and an open switch "opens" or breaks the path. Any disconnected terminals may also act as a switch. 

AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

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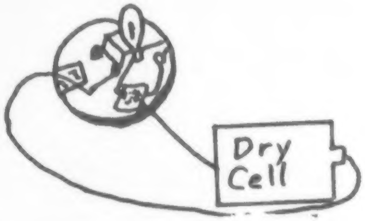
<tr><th>COMPETENCY/PERFORMANCE OBJECTIVE</th><th>CONCEPT</th><th>PROCESS SKILLS</th><th>SUGGESTED ACTIVITY</th></tr>
<tr>
<td>6. Distinguish between conductors and nonconductors (insulators).</td>
<td>Conductors and nonconductors</td>
<td>Operationally defining, experimenting, observing, classifying, inferring, predicting</td>
<td>A. Materials needed: 3 dry cells; 1 bulb holder; 3 copper wires; box containing many different kinds of small objects.
Build the circuit below:


Will the bulb light when a nail is put into the circuit? Try it? Take the nail out of the circuit. One at a time put each of the materials in your box in the circuit. Before you test the objects, predict what each will do to your bulb. Put your predictions and observations in the chart below. If the bulb doesn't light, you might try adding more dry cells to the circuit.
<table>
<tr><th>Things Tested</th><th>Prediction?</th><th>What Happened to Bulb?</th><th>How Many Batteries Used to Light?</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
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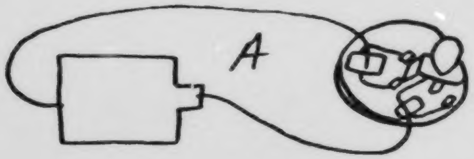
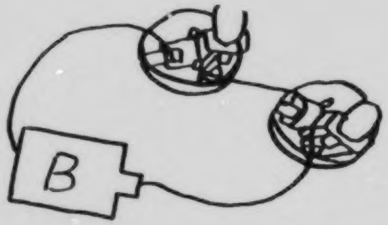
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Look at the materials that allowed the bulb to light. How are they alike? Look at the materials that did not allow the bulb to light. How are they alike? Teacher Information: In testing a large number of objects, children will observe, record, and classify these objects into two groups based on whether the bulb lights or does not light. This strategy (inductive or guided discovery) should lead the children to the concept of conductor and nonconductor (insulator). The introduction or invention of these terms should come at the end of the lesson, usually by the teacher. Children should infer that metal objects are good conductors. This lesson provides an opportunity for children to observe that other kinds of wire (besides copper) can conduct electricity.

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Remind children not to stick wires into electrical outlets or light switches. Metal objects covered by insulators, e.g., paint, provide challenges for children.
7. Diagram a series circuit.	Series circuit	Communicating, observing, inferring, predicting	A. Materials needed: 1 battery; 2 bulbs; 2 bulb holders; 3 wires. * An old string of christmas lights can be a great source for materials. What to do: Using your materials, make a circuit like the one in picture A.  Now add one more bulb in a bulb holder to the circuit. When one bulb is unscrewed (or burns out), the other bulb should also go out.

AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Try it! Draw a picture of your circuit (B).  Draw lines on the above circuits (A and B) showing where the electricity travels. Use a crayon or pencil. Compare circuit A with circuit B. Which circuit had the brighter bulbs, A or B? How can you explain this observation? In circuit (B), do both bulbs burn equally bright? How can you explain this observation? In circuit (B), why does one bulb go out when you unscrewed the other? What do you predict will happen to the brightness of the bulbs as more bulbs are added to the circuit (B)? Try it!

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			What did you observe? Suppose you had a string of Christmas tree lights connected like circuit (B). What would happen to the bulbs when one of the bulbs burned out? What would happen if the appliances in your home were arranged like the bulbs in circuit (B)? Teacher information: This activity should lead children to the introduction of the term "series circuit." When bulbs are connected in series, all the electric current flows through each bulb when the circuit is closed. If identical bulbs are used, each bulb in circuit (B) will receive one-half the voltage from the dry cell. Thus, each bulb in (B) will receive 0.75 volts from a 1.5 volt dry cell. Therefore, each bulb will appear dimmer than one bulb in the same circuit (A). If one bulb is disconnected (or "burns out") from the

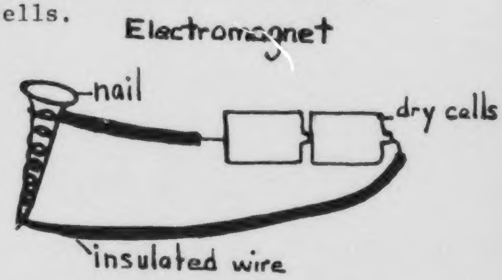
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			circuit, both go out because there is no longer a complete path for the current--the circuit is broken. If children have difficulty building their circuit, try to diagnose their problem and guide them to success. One group (who perhaps finished first) could draw circuit (B) on a larger piece of paper for later display and reinforcement of the concept of "series" circuit. This lesson is often taught by initially providing children with a picture of circuit "B" and asking them to use their materials to reproduce it and verify its "properties." Although it will save you time, this procedure will probably not be as highly motivating for your children as it does not involve the resolution of a problem. Rather, it involves simply a verification of a given concept.

AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
8. Diagram a parallel circuit.	Parallel circuit	Communicating, observing, inferring, predicting	A. Materials needed: 1 battery; 2 bulbs; 2 bulbs holders; 4 wires What to do: Using your materials build a circuit with 2 bulbs in it. This time when one bulb is unscrewed (or burns out), the other bulb should stay lit. Try it! Draw a picture of your circuit. Draw lines on the picture of your circuit showing where the electricity travels. Use crayon or pencil. Do both bulbs burn equally bright? How can you explain this observation? Unscrew one bulb so it goes out. How can you explain this observation? What do you predict will happen to the brightness of the bulbs as more bulbs are

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			added to the circuit? Try it! What did you observe? Suppose you had a string of Christmas tree lights connected like your picture above. What would happen to the bulbs if one "burned out"? Teacher information: This activity should lead children to the introduction of the term "parallel" circuit. When bulbs are connected in parallel, the electrical current branches off, and only part of the current goes through each bulb. Each bulb can, therefore, operate independently so that if one bulb is disconnected (or burns out) from the circuit, the circuit is not broken and the other bulb(s) continue to light. The children should observe that the second bulb in their circuit is as bright as the first bulb. Each bulb receives the full voltage of the dry cell (1.5 volts).

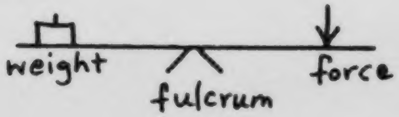
AREA: MAGNETISM AND ELECTRICITY
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			A good example of a parallel circuit is the double strand set of Christmas tree lights. All house circuits are wired in parallel so that all appliances and lights can be turned on and off separately without breaking the circuit.
9. State that electricity can be used to produce magnetism.	Electricity produces magnetism.	Observing, inferring, predicting	A. Students can make an electromagnet by wrapping an insulated wire around a large iron nail or rod and attaching the bare ends of the wire to one or more dry cells.  Test the electromagnet with tacks. Vary the number of dry cells and compare the number of tacks picked up by the electromagnet in each case.

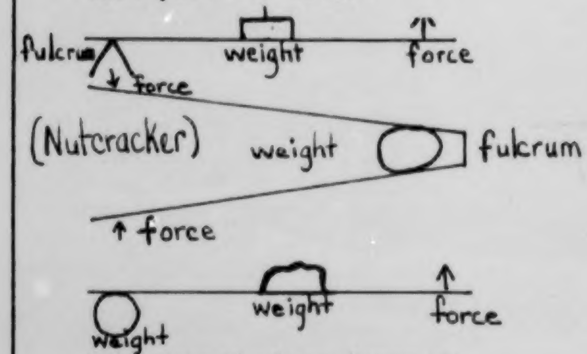
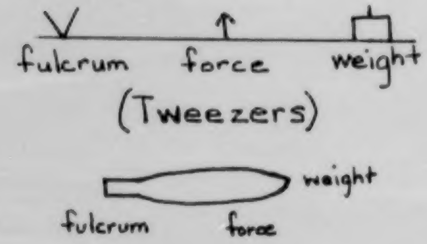
AREA: SIMPLE MACHINES
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. Identify and explain the function of simple machines.	Simple machines are levers, inclined planes, screws, wedges, pulleys, and wheels and axles. Simple machines make it possible to do work with less effort.	Experimenting, observing, inferring, measuring, interpreting data	*Appendix on measuring weight and measuring length may be helpful prior to the following activities on simple machines. A. Have several simple machines available: levers (claw, hammer, can opener, scissors, spoon, shovel, (nutcracker); inclined planes (board on block, screw, wedge); pulley systems with different mechanical advantages. Allow students to attempt to crack a nut with hands; then use a nutcracker; attempt to pull out a nail without a hammer, then with a hammer; hold up a rock at a certain height without an inclined plane, then with an inclined plane; pick up a 1000 g mass without a pulley, then with different pulley systems. B. Construct different styles of levers and demonstrate ways they help in doing

AREA: SIMPLE MACHINES
GRADE: 4-6

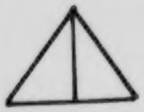
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			work. Show three parts of a lever--weight, force, fulcrum.  First class lever--Use claw hammer and screwdriver to take lid off can, etc. Make a first-class lever with meter stick, block, and mass as shown.
2. Tell the name for machines made of two or more simple machines and give an example.	Simple machines can be found as parts of many compound machines.	Observing, inferring, predicting, classifying	A. Have an array of tools or pictures of tools and have students point out simple machines involved. Examples: Levers--Hammer, pop bottle opener, see-saw, pry bar, forearm, wheelbarrow, nutcracker, tweezers, spoon. Inclined planes--Screws, actual inclined planes, wedge, teeth, knife, fork, etc.

AREA: SIMPLE MACHINES
GRADE: 4-6

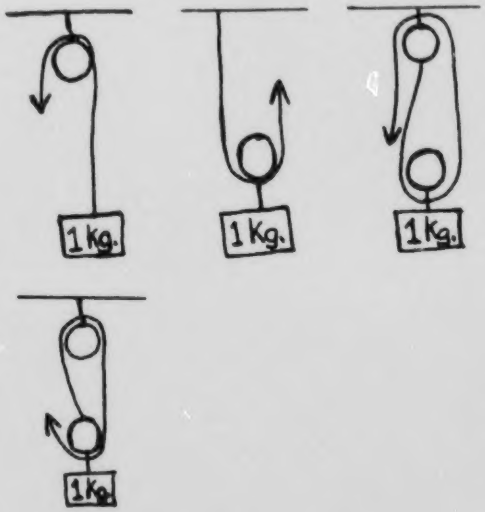
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Pulleys--Flag pole, crane Compound machines--Scissors - lever and wedge; pencil sharpener - wedge, screw, wheel. Second-class lever--Use nutcracker wheel barrow. Show parts of lever.  fulcrum weight force force (Nutcracker) weight fulcrum force weight weight force Make second-class lever as shown. Third-class lever - Tweezers, sugar tongs, forearm.  fulcrum force weight (Tweezers) weight fulcrum force

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Make a third-class lever as shown. Lift books with forearm as a third-class lever. B. Demonstrate how inclined planes help in doing work. Tie a heavy cord around a large book (dictionary). Lift bundle with spring scale (calibrated in metric). Place on top of inclined plane. With a 6-foot-long board, pull weight to top. Compare readings on spring scale. Repeat with 3-foot board. Show that a wedge (knife) is two inclined planes put together. C. Demonstrate how the screw helps in doing work. Cut a paper right triangle.

AREA: SIMPLE MACHINES
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Notice that one side is an inclined plane. Make black line along the edge of an inclined plane. Wrap a triangle around a pencil to show that an inclined plane is the same as threads on a screw. With two jars, one with screw-type of top and one that isn't, let children see which is easier to open. D. Demonstrate how the wedge helps in doing work. Show that a wedge is two inclined planes.  Ask students which teeth are used to bite their sandwich, front or back. Point out how front teeth are like a wedge. Let them cut something with a meter stick, then let the teacher cut it with a knife.

AREA: SIMPLE MACHINES
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			E. Demonstrate how pulleys and wheels and axles help in doing work. 1. Set up pulleys as follows:  With spring scale attached to free end of cord, show how force needed to lift 1

AREA: SIMPLE MACHINES
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			kg mass changes and makes work easier. 2. Wheel and axle--place several heavy books in a box and pull them across the floor using a spring scale. Either place pencils under the box and repeat or put the books in the wagon and pull to show how wheels decrease force needed.

AREA: MATTER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Distinguish between mass and weight.	Mass and weight	Defining operationally	A. Have children compare the mass and weight of a book, on earth and in space. On the earth it has mass (so many molecules make up the book). It also has weight (because earth's gravity is pulling down on the book). If you take the book in space, it still has mass--the number of book molecules has not changed; but it no longer has weight. It is too far from the earth for the earth's gravity to affect it. If I let go of the book, it will stay suspended in space. Mass is the number of particles that make up an object; weight is the force of gravity pulling down on it. Appendixes on measuring volume, measuring weight, and graphing may be helpful

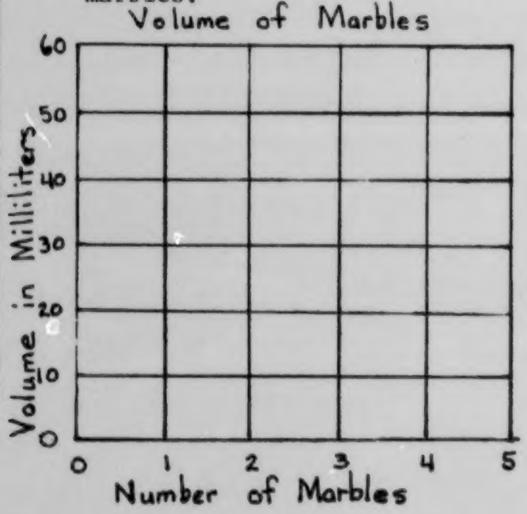
AREA: MATTER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			prior to the following activities on density.
2. Define density.	Density	Observing, experimenting, defining operationally, measuring, controlling variables, interpreting data, using numbers	A. The density of an object is the mass, in grams of 1 ml of the object. Part 1: Measure the volume of marbles by measuring the increase in the water level. The students will use a graduated cylinder filled with 50 ml of water and five marbles of the same size. Place one marble into the graduated cylinder. Record the rise in the water level (the rise will be the volume of the marble). Continue adding marbles until all five marbles are in the cylinder.

Volume of Marbles

Number of Marbles	Volume of Marbles in Milliliters
0	0
1	5
2	10
3	15
4	20
5	25

AREA: MATTER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Key Questions: What happens to the water level as more marbles are added? Why did the water rise higher? Have children label each axis of their graph. The horizontal, or x-axis, is for the manipulated variable (number of marbles). The responding variable is the variable that the students measured (volume, in milliliters). It is placed on the vertical, or y-axis. The numbers on the y-axis will vary depending on the volume of their marbles. 

AREA: MATTER
GRADE: 4-6

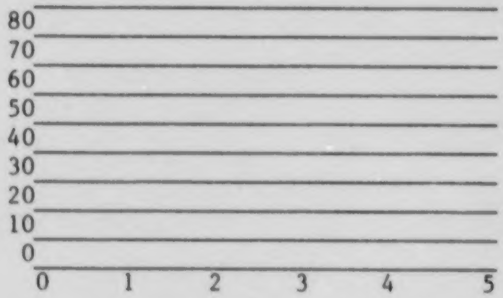
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Record the observations from their data charts onto the graph. Part 2 The students then find the mass of the marbles. Use a balance to find each marble's mass in grams. Find the mass of one marble, two marbles, three marbles, four marbles and five marbles. Record the masses onto a data chart.

Mass of Marbles

Number of Marbles	Mass, in Grams
0	
1	
2	
3	
4	
5	

They will then record their observations on a graph as they did in Part 1.

MASS OF MARBLES



Part 3

Have students record their volumes and masses onto a data chart. Use their data charts from Part 1 and Part 2.

Mass and Volume of Marbles

Number of Marbles	Volume, in Milliliters	Mass, in Grams
0		
1		
2		
3		
4		
5		

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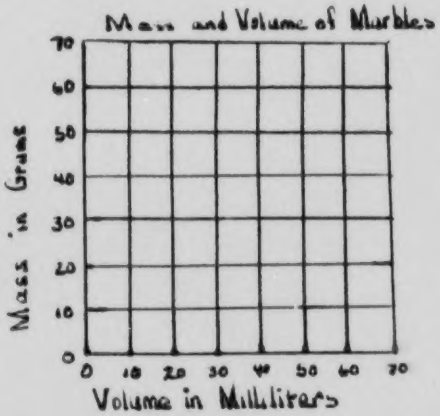
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Record their observation from their data chart Mass and Volume of Marbles onto a graph.  They may use the graph to find the density of a marble. NOTE: The density is found by plotting the mass and volume and then reading the mass of 1 milliliter from the graph. Density may also be found by using a number sentence: Density equals mass divided by volume, or D = M-V.

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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
3. List the three states of matter and state examples of each.	States of matter	Classifying, observing, communicating, inferring	A. Students will classify substances into solids, liquids, and gases as they paste pictures from magazines and/or draw pictures depicting examples of each state of matter using a separate sheet of paper for each group. B. Activity: Demonstration on the differences between solids, liquids, and gases 1. Solid: Students will get as close as possible with very little movement, demonstrating a solid with a definite shape and volume. 2. Liquid: Students will hold hands, moving around to form many different shapes. Each time the chain is the same length, thus the same volume. 3. Gas: Students will drop hands and move quickly around the room spreading out in all direc-

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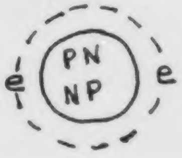
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			tions, demonstrating that gases do not have a definite shape nor a definite volume. Point out that since the students are not holding hands, they could spread into the halls and school yard at recess time.
4. Tell the name for the smallest particle of an element.	Atom	Observing, inferring, communicating	A. See Activity in 5A. B. Students will identify the location of particles of the Helium atom by assuming the role of protons, neutrons, and electrons and physically form the Helium for the rest of the class. Then students will state where most of the mass is centered through observation. Helium Atom 

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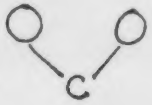
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
5. Name the three kinds of substances into which all matter can be grouped and explain how each kind of matter differs from each other.	Elements, compounds, and mixtures	Observing, inferring, experimenting	A. Activity: Relationships between atoms, elements, and compounds. Using colored gumdrops representing different kinds of atoms and toothpicks to hold them together, students will make models. Establish a color code for the atoms. An example is given below: Carbon C (Black) Oxygen O (Red) Hydrogen H (White) Nitrogen N (Blue) Construct models of the following: Carbon Dioxide: CO_2 

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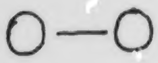
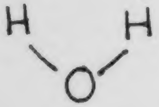
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			(This is a model of the compound carbon dioxide composed of 2 different kinds of atoms.) Oxygen: O_2  (This is s model of the element oxygen composed of 2 of the same kind of atoms.) Water: H_2O  (This is a model of the compound water composed of 2

AREA: MATTER
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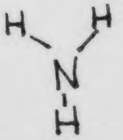
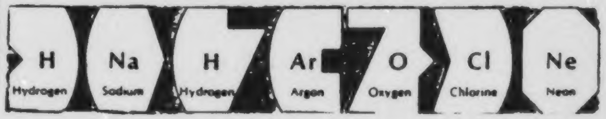
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			different kinds of atoms.) Nitrogen: N_2 N — N (This is a model of the element nitrogen composed of 2 of the same kind of atoms.) Ammonia: NH_3  (This is a model of the compound ammonia composed of 2 different kinds of atoms.) B. After performing the following activities, students will explain how each kind of matter differs from each other. Puzzle: Fits elements into compounds  H Hydrogen Na Sodium H Hydrogen Ar Argon O Oxygen Cl Chlorine Ne Neon

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AREA: MATTER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			C. Using the 2 compounds formed in the puzzle activity, complete the activity forming and separating a mixture. Here is a way to see what happens when two kinds of matter are mixed together. You will need a glass of water, a teaspoon, some table salt, a small pan, and a hot plate. Put two teaspoons of salt in the glass of water. Stir the water with the spoon. then set the glass down and look for the salt. Do you see the grains of salt? If not, where do you think the grains have gone? Now, taste the water. How can you tell that the salt is still there? Put the water in the pan. Heat it until all the water has boiled away. Let the pan cool and then taste the white matter that has been left behind. What do you learn from the taste? Where do you think the matter in the pan came from?

AREA: MATTER
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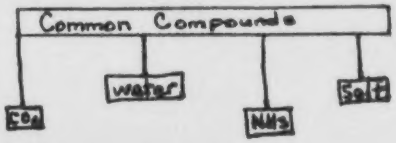
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
6. Identify the correct symbols for the following elements: H Hydrogen C Carbon N Nitrogen O Oxygen S Sulfur Fe Iron	Chemical symbols	Observing, communicating	A. Students will identify the common elements listed by playing the element concerntration game. Place the symbols on one set of cards and the names of the elements on another set of cards. B. Students will pick one of the elements listed (making sure the list is exhausted) and write a report on it answering as many of these questions as you can. 1. What is the symbol of the element? 2. How many protons, neutrons, and electrons does the atom of your element contain? 3. Who discovered or named the element? 4. Describe how the element is usually found. (Is it usually found as an element, compound, or in a particular state of matter?)

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			After the reports are shared with the class, students should be able to identify the elements and their symbols.
7. Recognize the chemical formulas for: Water H_2O Salt NaCl Carbon dioxide CO_2 Ammonia NH_3	Chemical formulas	Observing	A. Students will make a chemical formula mobile made up of water, salt, carbon dioxide, and ammonia writing chemical formulas on one side of each card and the common name on the other side as illustrated below:  Students will then recognize the chemical formulas for the names.
8. State the boiling point and freezing point of water in both degrees Fahrenheit and degrees Celsius.	Boiling and freezing points of water	Observing, communicating, measuring, inferring	A. Divide the children into groups of three or four. Give each child a Celsius thermometer, and give each group a clear container of crushed ice. Ask them to measure the temperature of the ice/water mixture which should be 0 degrees Celsius. If some of the ice melts, the children may get a reading

AREA: MATTER
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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			between 0 degrees C and 5 degrees C. As they report their findings to you, record their readings on the board. On the Celsius scale 0 degrees is the temperature of the freezing point of water. Ask what the room temperature is on the Celsius scale (about 20 degrees C - 23 degrees C). Ask whether the room temperature is always the same. Then they could record the room temperature at different times during the day. Then explain that room temperature may change, but the temperature of ice is always 0 degrees on the Celsius scale. You could also explain that 100 degrees on the Celsius scale is the temperature of boiling water. By using a thermometer which has a dual scale, Fahrenheit temperatures can also be obtained.

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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
9. Identify and differentiate between physical and chemical changes.	Physical and chemical changes	Observing, communicating, inferring, experimenting	A. Take a piece of paper and cut it into pieces (physical). Take another piece of paper and burn it (chemical). Discuss the results. B. Using table sugar, taste it, then dissolve it in water. Taste it again. If time permits, let the water evaporate and taste the results (physical). Place sugar in test tube of water which will be thrown away after the experiment. Heat the test tube over a flame until all the steam is driven off and a definite color change has occurred. Examine the results (chemical).
10. Identify and differentiate among acids, bases, and neutral substances.	Acids, bases, neutral substances	Observing, inferring, predicting, defining operationally, classifying	A. Observe how different liquids or substances affect a bromthymol blue (BTB) solution or litmus paper. Procedure: Small bottles of bromthymol blue (BTB) can be found in the aquarium section in a pet shop.

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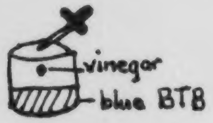
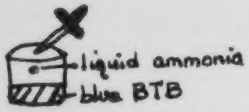
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Can you think of reasons why people buy BTB? To help find out, do the following activity. Add one drop of vinegar to a vial half-filled with blue BTB.  What change did you observe? Keep your vial. You will use it later. To a new vial of blue BTB, add one drop of liquid ammonia.  What color change did you observe? What happened when more drops of liquid ammonia were added? Can you make blue BTB turn yellow?

AREA: MATTER
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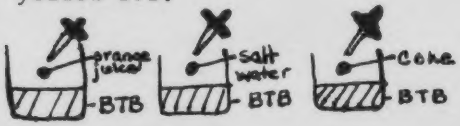
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			What have you learned about the BTB so far? Now add one or more drops of each of your test solutions (Coke, 7-up, Tab, milk, fruit juice, limewater, baking soda, salt, sugar, fertilizer, aspirin, etc.) to vials of BTB. To test dry powders like salt or sugar, dissolve some of the powder in a small vial of water. If the test solution does not change the color of blue BTB, see if it will change yellow BTB. 

AREA: MATTER
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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY

Record your observations in the chart below:

Test Solution	BTB Changed Color From	No Change
vinegar	blue to yellow	

How are those solutions that turned blue BTB to yellow alike?

How are those solutions that turned yellow BTB to blue alike?

How are those solutions alike that did not change either blue or yellow BTB?

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COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			How would you define an acid? How would you define a base? How would you define a neutral substance? How do you think the juice from a fresh tomato will change the color of BTB? What materials do you have at home that you would like to test with BTB? Concept: Certain substances, called acids, change blue BTB to yellow. Certain substances, called neutral substances, do not change the color of either blue or yellow BTB. Teacher Information: Bromthymol blue (BTB) is an "acid base" indicator that is found in most pet shops in the "aquarium" section. People buy it to check the level of acidity in their aquariums.

AREA: MATTER
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			A BTB solution is prepared by adding enough drops of the concentrated BTB (in the small plastic bottle) to a pint of water to make the solution dark blue. When an acid solution is added, drop by drop, to a small vial half-filled with BTB solution, the blue color changes to yellow. If a basic solution (liquid ammonia) is added to yellow BTB, the yellow color will change to blue. Thus, an operational definition of an acid would be any substance that changes a BTB solution from blue to yellow. By using a BTB solution, pupils can more easily observe the reversible nature of an acid-based indicator (blue BTB can be changed to yellow and back to blue by adding acids and bases in a sequential order). In collecting data in this activity, pupil data can be pooled, thus increasing the number of examples from which the invention of the concepts can occur. Solid substances such as sugar, salt, baking soda, soil, or fertilizer can be

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			tested by first dissolving them in small amounts of water. Because of the ease in handling, litmus paper lends itself for allowing pupils to transfer the lesson to their homes. B. Red cabbage juice is another acid-based indicator. It can be prepared by boiling red cabbage leaves in a small amount of water. The resulting concentrated solution of bluish-purple juice should be used soon after preparation or refrigerated. If left at room temperature over a period of time, the juice will become red due to the action of micro-organisms. This provides an interesting problem and an opportunity for pupils to investigate various means of observing and controlling bacterial growth. The reversible nature of this indicator can be shown by adding an acid such as vingar to the blue-purple cabbage juice. The resulting red color can

be changed back to blue-purple (or sometimes green) by the addition of a base such as liquid ammonia. See the chart below for color changes when drops of acids or basic solution are added to the juice.

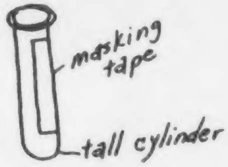
Indicator	Add Acid	Add Base	Add Neutral Material
Litmus Paper	blue to red red to red (no change)	red to blue blue to blue (no change)	No Change
BTB	blue to yellow	yellow to blue	No Change
Red Cabbage Solution	blue/purple to red	red to purple/blue	No Change

APPENDIX I

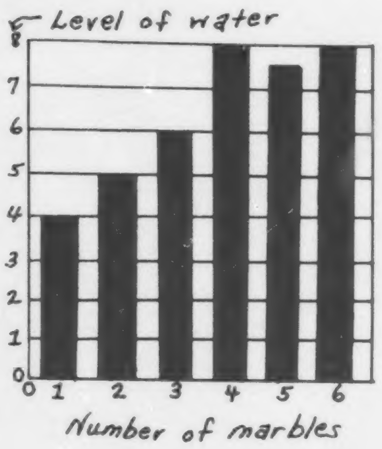
GRAPHING

K-3

AREA: GRAPHING
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
1. Construct a bar graph.	Using bar graphs	Observing, measuring, graphing, inferring	A. In advance, calibrate one graduated cylinder (or any tall, slender container such as an olive oil jar) for each group of children. To calibrate the cylinder, make a masking tape label (scale) on the side of the cylinder.  Place one marble in a 50 milliliter cylinder (a container that holds 50 ml of liquid). Then fill the cylinder with 20 milliliters of water and drop one marble in the water. Number the label so that the water level (water containing marble) is a number other than 1--such as 4 Figure A). Drop a second marble into the cylinder. Mark the new water level on the tape.
2. Construct predictions based on data presented in a bar graph.	Using bar graphs	Interpreting data	A. Divide the children into groups. Give each child five marbles and one calibrated cylinder contain-

AREA: GRAPHING
GRADE: K-3

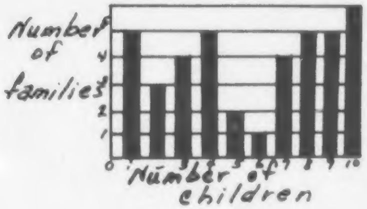
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			ing one marble and 20 ml of water. After each group has added three or four marbles to their cylinder, ask a child in each group to predict what the new water level will be when the next marble is added. Ask the students to construct graphs showing the water level change as each marble is added to their cylinders. You may want to review the rules for graphing from Level 1. Graphs for the cylinder activity should resemble the one below. 

AREA: GRAPHING
GRADE: K-3

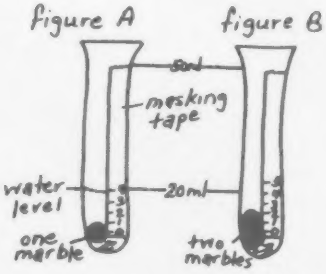
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Ask the children to look for a pattern in the data. Predict what will happen if you added seven, eight, or nine marbles. They can then test each prediction. B. Ask each child in the class to tell you the number of children in his or her family. Record the data on a chart on the board similar to the one that follows:

Number of children in family	0	1	2	3	4	5	6	7	8	9	10
Number of families		𝍸	𝍸 𝍸	|||	0	1	0	0	2	0	0

Have the children record the data from the chart on a bar graph.



AREA: GRAPHING
GRADE: K-3

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			After completing their graphs, ask questions that may be answered by reading their graphs. How may families have six children? Is the number of families with three children greater than the number of families with two children? How many children does the largest (smallest) family have?
3. Distinguish among quantities shown on a bar graph by using terms such as "greater than," "less than," "greatest," and "least."	Using bar graphs	Interpreting data	A. With a number that is one larger than the number marking the initial water level (Figure B).  figure A figure B 50ml masking tape water level 20ml one marble two marbles Repeat until 6 marbles are in the cylinder.

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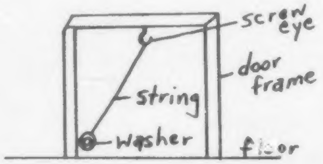
APPENDIX II

GRAPHING

4-6

AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Construct a line graph.	Construction of a line graph	Observing, inferring, communicating, graphing, interpreting data	A. Provide a pendulum so that its length may be varied. Attach a long string to a hook or screw eye in the ceiling or in the top of a door frame and then tie a weight to the free end. Make sure the pendulum swings freely. Start the pendulum swinging with the weight almost to the floor.  After careful observation of the swinging pendulum, ask the students to suggest ways they might change the swinging of the pendulum. Some suggestions would be to:
2. Identify the manipulated variable in an activity.			
3. Identify the responding variable in an activity.			
4. Label the horizontal and vertical axes on a graph.			
5. Plot data on a line graph.			

AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			1. Pull the weight farther to one side before you let it swing. 2. Pull the weight out only a little way and let it swing. 3. Push the weight as you let it go. 4. Change the weight to a smaller or larger size. Accept and try as many suggestions as possible. Test this hypothesis. Ask the students how does the number of swings that a pendulum makes in one minute depend on the length of the pendulum. Start the timing when the weight is released. When it returns to the point of release for the first time, count "one, two," etc., until exactly one minute has passed. Have the students work in groups of 4 or 5. Have them start with a pendulum 180 cm long. Then shorten the pendulum to 150 cm, 110 cm, 70 cm, and 50 cm. They will need to

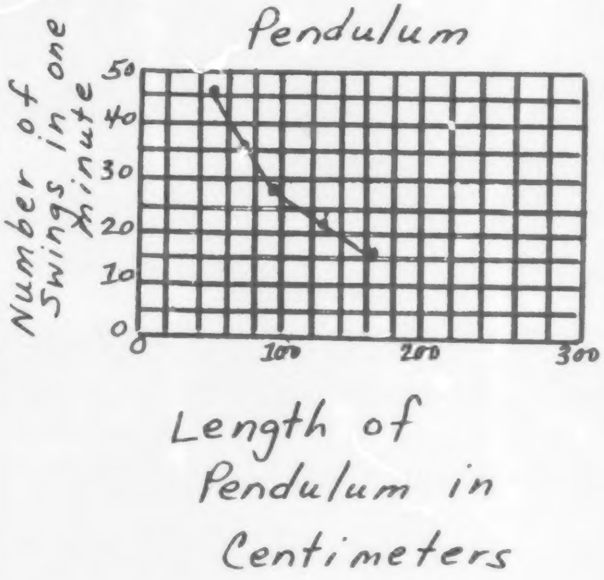
record their information on a data chart.

Length of pendulum in centimeters	No. of Swings in 1 minute
50 cm	42
70 cm	36
110 cm	29
150 cm	24
180 cm	22
(manipulated variable)	(responding variable)

Before you have the students plot their data on a graph, review the rules for labeling a line graph. Also review previous line graph activities.

1. The manipulated variable (the variable that is changed systematically) is plotted on the vertical axis.
2. The responding variable (the variable that is measured and changes as a result of or as a reaction to the change in the manipulated variable) is plotted on the horizontal axis.

AREA: GRAPHING
GRADE: 4-6

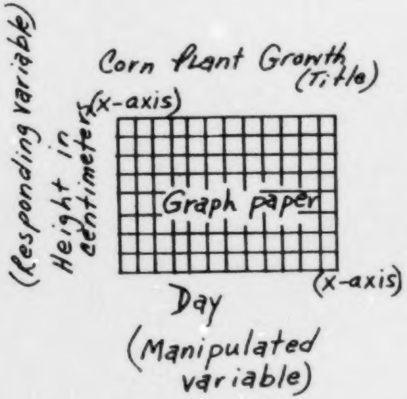
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			3. Label each axis with the name of the variable and the unit of measure used. 4. The number pairs are plotted as a point. 5. The number scales are visually chosen so that the graph covers most of the paper. 6. The number scales do not have to be the same along both axes. 

AREA: GRAPHING
GRADE: 4-6

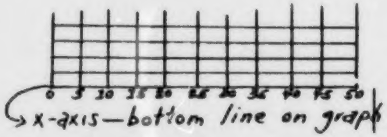
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
6. Identify and name the manipulated variable (any factor in a situation that is systematically changed or manipulated) and the responding variable (any factor in a situation that changes as a result of or as a reaction to the change in the manipulated variable).	Making a line graph	Observing, controlling variables, communicating, measuring, interpreting data, graphing	A. Divide the children into groups and have each group plant a corn seed. Then water it with liquid plant food. The liquid should contain all of the materials needed for growth. The group should begin measuring the plant's growth when it first appears. Then measure its tallest leaf for 30 days.
7. Construct a line graph from data obtained in an investigation about the growth of a corn plant.	Identification of a manipulated variable		Each group should record their data on a data chart similar to the one below. Of course, the numbers for heights and days measured will vary among groups.
8. Identify data presented on a graph or table that provides an answer to the questions being investigated.	Identification of a responding variable		

CORN PLANT GROWTH

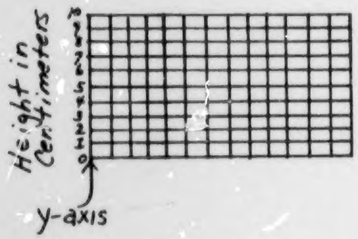
Day	Height, in Centimeters
0	0
2	.6
6	1
10	1.5
14	2.5
16	3
20	4
24	5
28	7
30	8

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Have the students graph their data (from the data chart) individually. They will need to identify the manipulated variable in their experiment. The horizontal or x-axis is for the manipulated variable. They should identify the number of days the plant was measured as the manipulated variable. Then they will need to identify the responding variable. The responding variable is placed on the vertical or y-axis. They should identify the height in centimeters as the responding variable.  Corn Plant Growth (Title) (x-axis) Height in centimeters (Responding variable) Graph paper (x-axis) Day (Manipulated variable)

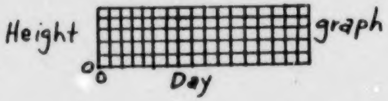
AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Now they are ready to graph their data charts to decide on the numbers that they will need to graph their data. Have them look at the first column of the data chart. The first column is for the manipulated variable (the number of days). Ask them to identify the smallest number that must fit on the x-axis; the largest number. The numerals 0 to 30 must fit evenly on the x-axis.  0 5 10 15 20 25 30 35 40 45 50 x-axis—bottom line on graph They will then need to look at the data in the second column. It is for the responding variable (the height in centimeters). Ask the children to identify the smallest number that must fit on the y-axis (0); the largest number (8). The numerals from 0 to 8 must fit evenly on the y-axis.

AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			 Now they are ready to graph their data. They will need to look at their data charts while graphing the data. The chart has 10 number pairs. They will put one dot on the graph for each number pair. The number pairs are: (0,0) (2,0.5) (6,1) (10,1.5) (14,2.5) (16,3) (20,4) (24,5) (28,7) (30,8)

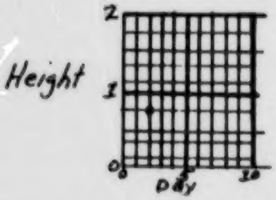
AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			The first number pair (0,0) shows there was no growth on the day the seed was planted. Have them find 0 on the x-axis. Then find 0 on the y-axis. Place a dot where the two lines meet.  Have the children look at the next number pair (2,0.5). After 2 days, the height of the leaf was 0.5 cm. On the x-axis, find the vertical line that stands for 2. Now look at the y-axis. The height at 2 days was 0.6. If your students aren't familiar with decimals, you could use fractions. You may want to review decimals before they begin measuring their plants. If your students aren't familiar

AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY

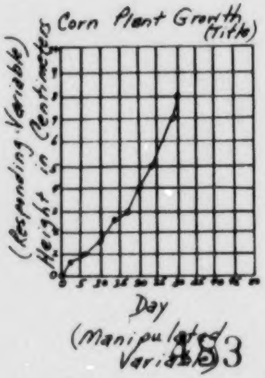
with decimals and fractions, then use whole numbers. Ask the students to find the line that would stand for 0.6 cm of growth. Place a dot where the line for 2 days and the line for 0.6 cm meet.



Go to the next number pair (6,1). Ask which line stands for the number of days; for the height. Put a dot where the two lines meet.

Continue locating each number pair with a dot. The children may need help with the heights of 1.5 and 2.5. For example: where is 1.5 on the y-axis? Think of it

AREA: GRAPHING
GRADE: 4-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			as half way between 1.0 and 2.0. B. They could compare two sets of data by putting both sets on one graph. They would need to use a key for each set of data (for instance, a dotted line to connect the dots on one graph and a straight line to connect the second set of data on the same graph could be used.) After they have drawn all 10 dots on their graphs, they will need to connect the dots with a line. Now they can use their graphs for predicting (extrapolation). How tall do you think the plant might have been at 15 days of growth? On what day do you think the plant would be 10 cm long? 

APPENDIX III

Measuring Volume, Length, and Weight

K-6

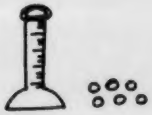
AREA: MEASURING VOLUME
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Demonstrate a way to compare two volumes.	The amount of liquid a container holds is a measure of the volume of the container	Measuring	A. Put four clear jars in a central location. (Note: Two of the jars should vary in size--tall and narrow, short and wide--but their volumes should be similar.) Fill these two jars with colored water. The other two jars should be identical in size and shape, such as two mayonnaise jars. These jars should be empty. Tell the children that the amount of liquid a container holds is a measure of the volume of the container. The volume of a container does not change; the same container always holds the same amount of liquid.
2. Identify which of two containers has the larger volume.	Comparing volumes	Measuring, communicating	A. Ask the children to find a way to find out which of the two water--filled jars holds more water or has the larger volume. They can use only the equipment on the table. Collect their ideas and have individual children demon-

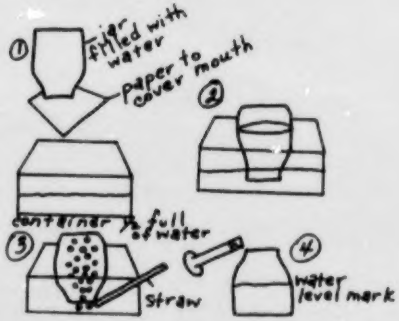
AREA: MEASURING VOLUME
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			strate them. The following are some of the methods that could be tested: 1. Pour the water from one of the labeled jars into one of the two identical large containers. Pour the water from the other labeled jar into the second large container. Compare the water levels in the two identical containers. If the level of the water is higher in one container than in the other, the volume of the jar that originally held this water is the larger of the two. 2. Pour the water out of one of the labeled jars and pour the water from the second one into the first. If it all goes in with some space left over, the first jar is larger than the second; if all of the water will not go in, the second has the larger volume.

AREA: MEASURING VOLUME
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			3. Pour the water from one of the labeled jars into one of the two identical containers, and mark the level of the colored water on the side of the jar; then pour the water back to refill the first labeled jar. Pour the water from the second labeled jar into the large marked container, and compare the level of the liquid with the mark previously made. If interest continues, let groups of children use different methods to compare volumes of water in the jars.
3. Demonstrate how to measure the volume of liquid using metric units.	Using metric units to measure volume	Observing, measuring	A. Show the children a graduated cylinder and several marbles. 

AREA: MEASURING VOLUME
GRADE: K-6

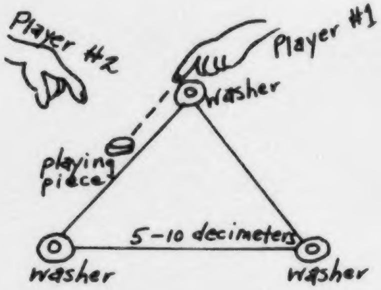
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			Pour 25 millileters (ml) into the cylinder, and have someone read the volume. Remind them to measure accurately. If the graduated cylinder is held at an angle while the level of the substance is read, there is a chance for error in measurement. They should be sure that their eyes are level with the top surface of the substance when they read the volume in the graduated cylinder.
4. Name the volume of a liquid in metric units.	Using metric units to measure volume	Communicating	A. Ask if anyone can suggest a way to find the volume of a marble by using the graduated cylinder and water. Drop a marble into the cylinder. Ask what the volume of the marble is. (It is the water level change.)  ① jar filled with water paper to cover mouth ② container ½ full of water ③ straw ④ water level mark

AREA: MEASURING LENGTH
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to:			
1. Name various units of length in the metric system.	Introduce the metric units of linear measure (m, dm, cm)	Measuring, estimating, inferring	A. Divide the children into small groups and give each group a meter stick. Have the children review the markings on the meter stick. Ask the children to use the meter stick to show you the length of a cm, a dm, and an m. Have each child measure width of a finger and report their results. (A finger is about 1 cm wide.) Have the children measure the distance from the tip of their middle finger to the heel of the palm. This length is approximately 1 dm. Let them measure one child's "gaint step." The step should measure approximately 1 meter. Ask the children to estimate the height of one child in dm. (Select a child who is about 1/2 as tall as the door is high.) Ask another child to measure the child, and then compare the child's height with the height of the doorway. The doorway is about twice the
2. Construct estimations of linear dimensions of common objects in terms of centimeters, decimeters, or meters.	Units of length in the metric system are related to each other by powers of 10 as follows: 10 cm = 1 dm 10 dm = 1 m 1 m = 100 cm 1 cm = 0.01 m (1/100th) 1 dm = 0.1 m (1/10th)		
3. Identify a known object that is approximately the same length or width as another object.			

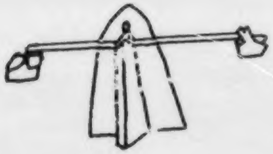
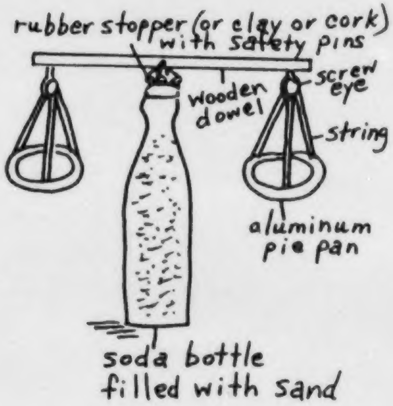
COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			height of the child. Emphasize that with a mental image of the child's height or the door's height, one can estimate the height of other objects without having to measure them. Note: Estimating is a skill that requires a familiarity with a measuring system. In turn, practice in estimating leads to greater facility in the use of this measuring system. Play an estimation game. Set it up by placing three bases 5 to 10 dm apart so that they form an equilateral triangle. Each player needs a playing piece and a scorecard; each pair of children needs one meter stick to check estimations of distances. The first player begins the game by placing a playing piece next to one of the bases. The second player puts his finger alongside the piece to mark its position. The first player then moves the piece

AREA: MEASURING LENGTH
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			toward one of the other bases by giving the piece a quick push with his finger.  Player #2 Player #1 washer playing piece 5-10 decimeters washer washer The first player records a move on his score card and then estimates the distance in cm or dm from the starting point of the piece (where the second player's finger is to its position after the move). The first player then measures the distance with the meter stick. If his estimation was within an acceptable range (an estimate of measurement that is 10 units or more should be accurate within 2 units), he moves again toward the target

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			base. If not, the second player takes a turn. Play continues until each player has moved around the triangle, touching each base in turn. The winner is the player that moves around the triangle in the smaller number of moves. Note: Variations of the game could be played using other metric units of length.

AREA: MEASURING WEIGHT
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
The student will be able to: 1. Demonstrate the principle of an equal-arm balance.	Using a balance	Experimenting	A. The children will compare objects on the basis of weight by lifting them with an equal-arm balance.  If an equal-arm balance is not available, one could be made with a soda bottle, safety pins, wooden dowel, aluminum pie pan, string, sand, and eye screws.  rubber stopper (or clay or cork) with safety pins screw eye wooden dowel string aluminum pie pan soda bottle filled with sand

AREA: MEASURING WEIGHT
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
2. Order objects of different weights by lifting them and by comparing them on an equal-arm balance.	Weight is the force resulting from the pull of the earth on objects	Predicting, measuring	A. When two objects being compared have nearly the same weight, an equal-arm balance will provide a precise method of comparison. Two objects having the same weight will balance each other if they are placed on opposite pans of an equal-arm balance. On a table arrange a collection of common objects that are sufficiently different in weight so that the children can order them from lightest to heaviest by lifting them. Extend this activity of lifting and ordering to include a series of objects that look alike and have about the same volume but "feel different" when they are lifted because some are heavier than others. Coffee cans with plastic lids or similar containers filled with different amounts of sand may be used.

AREA: MEASURING WEIGHT
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
	Weight is a force down or earth-pull of an object	Measuring	B. Repeat the activity in A by using a book, a drinking straw, a box of crayons, a ruler, and a chalkboard eraser. Have the children arrange the items in order from lightest to heaviest. After this review, separate the children into groups and provide each group with an equal-arm balance. Also give each group an identical collection of small objects to be weighed (toy cars, washers, bolts, nuts, small cubes, bar magnets, hand lenses, etc.). Some objects should weigh the same or nearly the same. (Ask the children to compare and order the assorted objects by using a balance.) After the children have had sufficient time to experiment, ask someone from each group to report to others the order into which the group put the objects. If there are disagreements, have the members of one of the groups demonstrate how they made their measurements. Variations in

AREA: MEASURING WEIGHT
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			results may be due to any one of the following factors: 1. The children may have used a balance that was not correctly adjusted. When the pans are empty the balance arm should be level. 2. Some minor variations in weight may exist among objects of the same kind. C. Put an object in one of the pans of a balance and ask the children what you would need to make the pans balance. Someone may tell you to put something more on the "up" pan or to make the force bigger on the lighter side. A good suggestion is to put small identical objects, such as paper clips, washers, or cubes in the second pan until balance is achieved. Then the children can see that one

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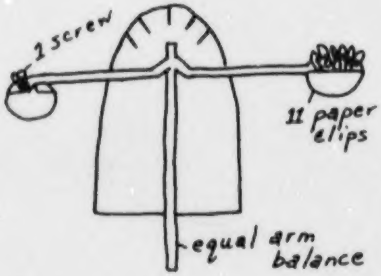
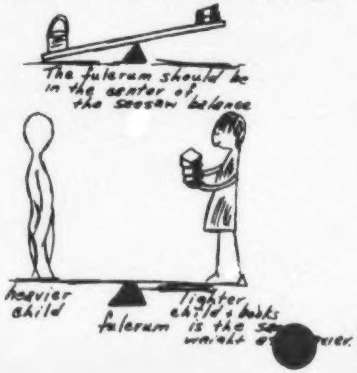
AREA: MEASURING WEIGHT
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			object is balanced by, or has the same weight as, 11 paper clips.
			
			Separate the children into groups and give each group a balance, paper clips, and an identical collection of small items to be weighed. Have them count the number of paper clips needed to balance each object. Ask them to record the number of

AREA: MEASURING WEIGHT
GRADE: K-6

COMPETENCY/PERFORMANCE OBJECTIVE	CONCEPT	PROCESS SKILLS	SUGGESTED ACTIVITY
			paper clips needed to balance each object. Ask them to record the number of paper clips on paper or on the chalkboard. Have the children compare the number of paper clips required to balance each of the objects. Since the objects are identical, the results of each group should agree closely. D. With a large see-saw balance, two children can compare their own weights. Ask the children to stand at equal distances from the fulcrum (central support). If the lighter child is handed several identical books, one at a time, until the see-saw is balanced, the weight of the heavier child can be expressed as the same as the weight of the lighter child plus the number of books he or she is holding.


The fulcrum should be in the center of the seesaw balance
heavier child
fulcrum
lighter child + books is the same weight as heavier.

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EVAULATIVE TECHNIQUES

Methods for evaluating pupils' achievement and progress are an integral part of the instructional program. Evaluation techniques must reflect (1) the objectives to be reached, and (2) the activities employed to reach those objectives. Since the objectives are stated clearly, the method of evaluation is indicated within the objective. The objectives are stated in behavioral terms, the process skills are identified, and suggested activities are listed. Thus, it is clear what the student is expected to be able to do after successful completion of a learning activity. The student can demonstrate successful attainment of an objective by doing specific things which can be observed.

It is important that evaluation should consist of more than just paper and pencil tests on recall of factual knowledge. A variety of evaluative activities should be used.